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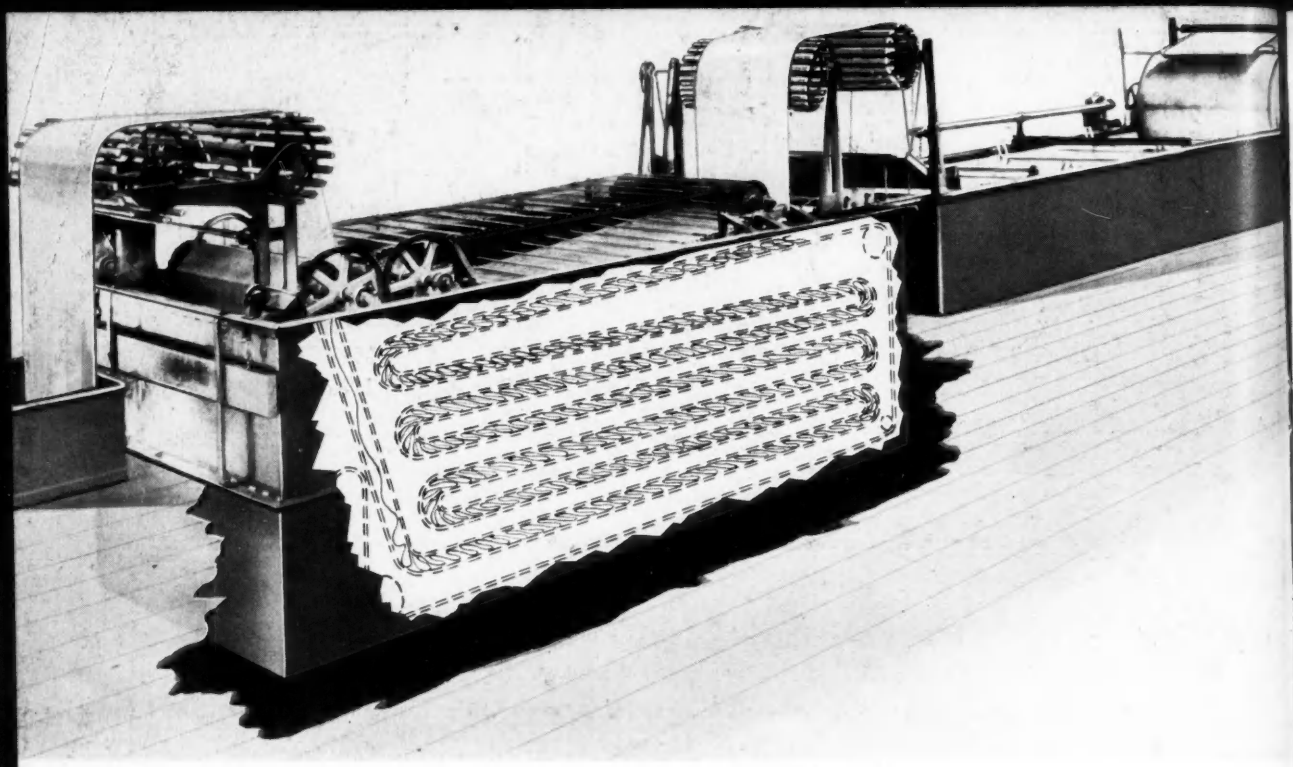
OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS



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Official Publication of the American Association of Textile Chemists and Colorists

THE OBJECTS OF THIS ASSOCIATION ARE:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable way research work on chemical processes and materials of importance to the Textile Industry.

"To establish for the members channels by which the interchange of professional knowledge among them may be increased."

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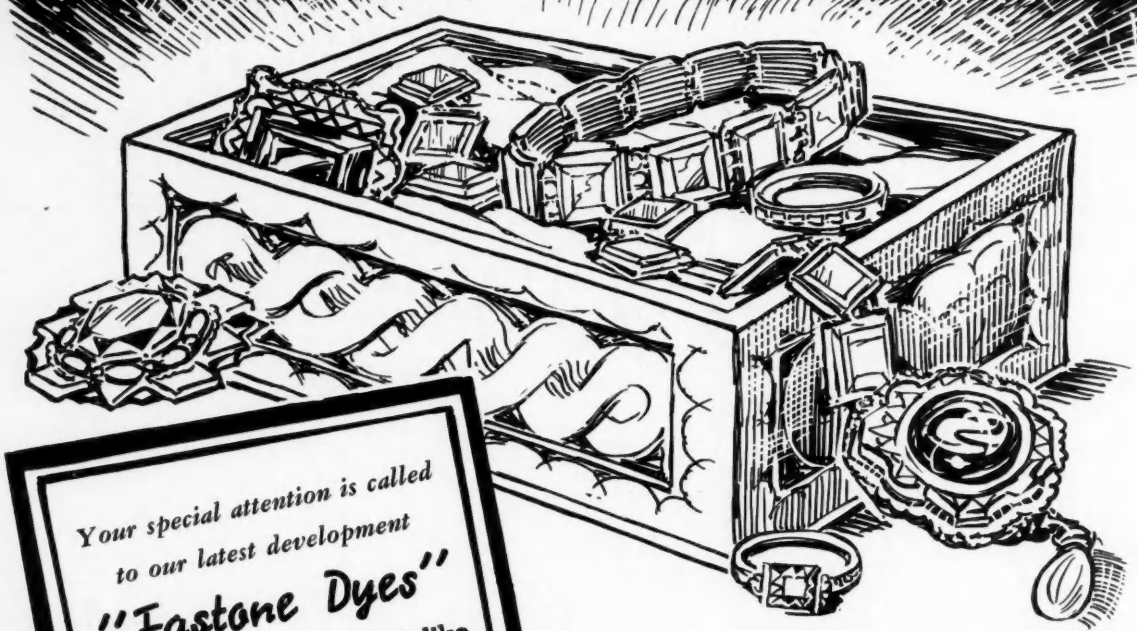

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MAY 30, 1938

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Outing, Rhode Island Section, Pawtucket Golf Club, Pawtucket, R. I., June 10, 1938.

Outing, Philadelphia Section, Whitemarsh Valley Country Club, Whitemarsh, Pa., June 10, 1938.

Outing, Northern New England Section, Andover Country Club, Andover, Mass., June 17, 1938.

Summer Outing, Piedmont Section, Ocean Forest Hotel, Myrtle Beach, S. C., June 24 and 25, 1938.

Outing, South Central Section, Lookout Mountain Hotel, August 5 and 6, 1938.

Annual Meeting and Convention, Atlanta Biltmore Hotel, Atlanta, Ga., December 2 and 3, 1938.

Some Aspects of Water Repellency*

RUDOLPH LINDENMAIER**

WATERPROOFING at the present time is undoubtedly very much in the center of interest because practically every type of fabric and almost every type of fiber is being waterproofed for different purposes and in different ways.

I tried to get some information together on the developments of the waterproofing trade, and also on the practical methods of waterproofing which are now employed. Then I would like to say a few words on the methods of testing waterproofed goods, picking out those which are simple to conduct and reasonably reliable.

The first satisfactory waterproofing effect on textiles was produced with wax. Paraffin wax is undoubtedly the most suitable substance. There are two methods of using it. The wax is dissolved either by heating or by the use of solvents such as benzene. Heat is by far the cheaper, simpler and safer method, but it has certain snags. To begin with, it is almost impossible to imagine that you can get an absolutely uniform waterproofing effect by simply dissolving the wax in a steam jacketed trough and passing the cloth through. The effect is most likely uneven and patchy.

Furthermore, the proof is not very durable because the fine wax film which is deposited on the surface will crack easily when the garment is worn or perhaps even when the cloth is made up into a garment, so the heat method is only used for coarser goods where the appearance of the cloth is not of much importance.

The method of using benzene for dissolving the wax was used very extensively years ago and is still used to a certain extent, perhaps not so much in this country as in England. This method is very cheap as far as cost of material goes, because wax and benzene are low in price. In addition to benzene being a cheap product it can be used over and over again because at least seventy-five per cent of it can be recovered, sometimes even eighty or eighty-five per cent. The cloth is passed through the wax bath made up with benzene. It then goes through a standard frame which is closed in and all the vapors are collected, and the benzene is recovered for future use.

The finish produced in this way is very good from a repellency point of view. It is quite satisfactory from a hand point of view, and the cost of material is very low. There is just one drawback and that is the danger of the process. Factory inspectors dislike to see plants where high inflammables are in regular use. Thus insurance premiums amount to a substantial sum, and this, of course, increases the cost of the proofing.

I know of a plant in England that has established a world reputation, namely Cravenette, who started using this process fifteen or twenty years ago and still use it to a certain extent.

Other methods which have been in use for some considerable time consist in emulsifying waxes with soap and fats for waterproofing heavy canvas materials and heavy goods of that nature. But it is obvious that for any goods where the appearance is of any importance such a finish can't be used because there again the effect is uneven and cloudy.

The most important development in this field during the last ten years or so was to evolve emulsions made from wax which can be reduced readily with water and applied in a short time. They are of two types, principally. The one is an emulsion of the wax only, and in order to obtain the proofing effect one has to mix into the wax emulsion a certain amount of aluminum acetate or formate for fixing the proof. That method can be used either in two baths or one bath. The other type of wax emulsion already contains the required amount of aluminum salt for fixing. Comparing the two types, we can say as a rule that the emulsion which does not contain any aluminum salt is of a very much finer dispersion and will give a softer hand. Another important point, especially when it comes to rayons, is that the latter type usually has less dulling effect.

Against those advantages are one or two disadvantages. The first is, the stability of these emulsions is not quite as good as the stability of an emulsion that contains the aluminum salt already. Another thing: If these emulsions are used by the one-bath method it is almost impossible to feed into the bath or to weaken the bath.

Another advantage of using the product which contains the aluminum acetate or aluminum formate, as the case may be, consists in the firmness produced in the goods, which in quite a number of cases is an asset, especially if materials have to be reproofed by dry-cleaners. If any waterproofed goods have to be dry-cleaned and then reproofed they usually are ragged, because whatever size

*Presented at meeting, New York Section, Feb. 25, 1938.
**Sandoz Chemical Works, Inc.

was in the original material has been taken out through the dry-cleaning process, and something ought to be put back into the material to make it feel more like a piece of cloth. As a rule, an emulsion containing an amount of aluminum acetate will be more satisfactory for that.

Keeping an eye on the question of stability, it is quite useful to know what substances mainly interfere with the proofing bath. Probably the most serious offender in that respect is sulphate in any shape or form, whether it be salt from the dyeing which is left in the goods or any other compound containing sulphate. It is wise to keep away from those to prevent any precipitated baths which increase the cost.

Taking the individual fibers, one after another, I would like to mention in connection with cotton that undoubtedly the most suitable goods for waterproofing are raincoats or uniform cloths, or some of the corduroy goods which are used for winter wear or other outdoor wear and have to stand a lot of wet weather. Recently some cotton automobile cloths were waterproofed. It is unquestionably for goods of that type that waterproofing is of definite advantage.

The application is done on the jig or in a padding machine, and in most cases this is perfectly satisfactory. In a plant where the waterproofing trade amounts to only a small percentage of their production there is no justification in going to considerable expense for the construction of special machinery for the process. On the other hand, in those plants where the waterproofing business amounts to a considerable trade it is unquestionably advisable to have a special machine available for the job. Something like a five box padder is most satisfactory for the purpose. One can adjust the process and make combinations exactly to suit the type of work required. Everyone of the five boxes can be used for the proofing solution, having a nip in between each box which insures good penetration of the cloth of vital importance in waterproofing.

If the waterproofing emulsion is satisfactory and the cloth is properly penetrated with it, the effect should be good. An intermediate squeezing operation always helps to give better penetration.

On the other hand, a machine of the type mentioned can be used very satisfactorily for weighting and proofing. I brought with me three cuttings of one hundred per cent cotton upholstery material which has been done in that way. The cloth was run through two boxes containing weighting substances, mainly dextrin, gelatin and a certain amount of glucose. Then it was run as a continuous process through a waterproofing bath. The finish is quite satisfactory. It was done by one of the mills in the South.

Another fiber on which waterproofing is being carried out in very considerable quantities is rayon. At this point I would like to mention that unquestionably the waterproofing trade on cotton and rayon has increased to a great extent on account of the promotion work which has been carried out by such firms as the Aqua Sec Corporation drawing the attention of the users to the increased wearing properties of waterproofed articles and making them waterproof minded.

One purpose for which waterproofing on rayon goods is always of interest, aside from the waterproofing effect, is the question of shrinkage on storage. It happens quite frequently that goods after finishing are left laying in the mill or at the converters and shrink between two to four per cent. This renders the subsequent cutting up into garments very difficult.

In most instances the shrinking was purely and simply due to the fact that the moisture of the atmosphere was absorbed by the material and caused shrinkage. By applying a waterproof finish the goods are not affected by the moisture and, therefore, keep the original length and width.

This has proven of considerable interest on certain types of rayon or cotton goods used for zip fasteners, where shrinkage of the tape interferes with the making up of the tape later on. When waterproofing those before sending them out, the difficulty is overcome.

As far as the application on rayon goods is concerned, it is very much the same as for cotton. The proofing is done on the jig or on a padding machine, and where a special machine is available allowing several impregnations of the cloth, this is undoubtedly satisfactory. One point has to be borne in mind, and that is that the goods will not get any friction or strain during the mechanical treatment. In other words, it is essential that the machinery be smooth running.

The next point I would like to mention is the waterproofing of hosiery and knit goods. In this particular trade the question of change of shade has been discussed repeatedly, probably due to the fact that very often several fibers are present in the hose and they are affected differently by the waterproofing compound. Tests have been carried out with special products designed for the purpose of waterproofing such hose or knit goods without interfering with the shade.

It has been possible to evolve a waterproofing compound that will not affect the Direct or Acid color on cotton, rayon, real silk or wool, as the case may be. It is of some interest to note that most people have always felt that the Direct color is mainly responsible for the change in shade during waterproofing, because most of the waterproofing agents are on the acid side. When working on this problem, however, we found that the Acid colors were just as liable to be changed. A sample card has been published illustrating several Direct and Acid dyeings before and after proofing with one of the Cerol compounds. One other point that has to be borne in mind in waterproofing stockings is that an equally good effect be produced on the panel as on the tops in order to insure uniformity.

When it comes to real silk, generally speaking, the requirements are the same as on rayon. It appears that the manufacturers, who are anxious to produce a maximum effect on that type of fabric go to the trouble of proofing

the yarns after dyeing. The cloth is woven up from these proofed yarns and then given a second waterproofing treatment in the piece.

This also should really be done when waterproofing acetate umbrellas because no fiber is more difficult to penetrate satisfactorily than acetate and it is hard to get good absorption on a tightly woven acetate piece such as is used for umbrellas.

No doubt wool opens up a tremendous field for waterproofing because wool is worn during the season when the garments are exposed to a considerable amount of wet weather. Most of the woolen goods have to be treated directly in the dye kettle and for that reason it is an advantage to use a product which is reasonably stable. In view of the considerable amount of work that has now been done over several years in connection with waterproofing of wool, and of the literature which is available on that subject, it is probably unnecessary to enlarge further on this question.

There is a new field which is just opening and which should be attacked, and that is the waterproofing of paper. During the recent months increasing interest has been shown in different sections of the paper trade in the producing of a good waterproofing finish. Generally speaking, the same principles that apply to textiles also hold good for the waterproofing of paper. It is only natural that one cannot expect as durable a finish on paper as it is possible to produce on a piece of cotton or woolen cloth. On the other hand, quite a fair waterproof can be obtained on paper. Information and samples of waterproofed paper can be obtained from the Sandoz Chemical Works on request.

One of the most important outlets for waterproofing paper is on twine. If the paper twine gets wet its strength is reduced to such an extent that it is useless, whereas waterproofed twine can be exposed to rain over a considerable length of time without any deterioration taking place. Packing paper, used for shipping goods, when exposed to moisture will also weaken, whereas if it is waterproofed its durability is appreciably increased.

Going over the methods of testing waterproofed goods, there is one more point to mention. Goods should be left to condition for at least twenty-four hours after processing before testing for proofing effect. Longer storing, such as a week or two, will still further improve the repellency. There are mainly two methods of testing:

1. Pressure Test.
2. Drop Test.

The pressure test is carried out by fixing the cloth at the end of a cylinder, water is gradually allowed to run into the cylinder until a first drop pierces through the cloth. Then the water inlet is turned off and the height of the water column is measured. An ordinary cotton cloth which is not proofed will not even stand sufficient water to take a reading, whereas one can get a fairly close comparison with different strengths of waterproofing agents or by comparing several waterproofing agents used at the same strength.

In order to give an illustration how fine a distinction can be made, I copied the average tests which were made on a flat cotton material as well as on a rayon material. On the flat rayon material, a one-quarter per cent solution of Cerol T which was used for that test only gave a water column of eight centimeters, whereas a one-half per cent solution gave ten, a three-quarter per cent solution gave fourteen, and a 1 per cent solution gave eighteen centimeters, which can be read off on the cylinder.

On cotton, the figure was, of course, comparatively higher, but there was the same gradual and accurate graduation. The figures were taken from five or six readings for each type. If you want to be particularly accurate you should take ten readings for each case to get a good average.

The drop test is carried out by fixing the material at an angle of 45° and allowing the water to drop on it from a height of six inches. It is also important that the rate of the drops be kept constant. We have found that ninety drops a minute is a pretty sound method.

To give you an idea how the scale of the drop test goes, we also tested some cotton material which was a fairly heavy gabardine cloth, used either for golf jackets or something of that type, and a one-quarter per cent solution of the Cerol T went up to 160 drops before the cloth was wet out. The one-half per cent solution of Cerol T showed 227, the three-quarter per cent 284 and the 1 per cent solution up to 410. So the drop test is also quite an accurate indication of the proofing effect. It may be used to establish the percentage required of a particular product or to compare the merits of two or three products.

Another test which is used mainly on heavy goods is to form a cone out of the cloth large enough to hold a half pint of water. On the heavy goods which are used either for automobile covers or any other outdoor wear, even for tent materials, the test is to hold a half pint of water for at least two days, that is, 48 hours, before any drop is allowed to show through. If it stands up to that test it is considered suitable for tent materials or sailcloths.

One other way of testing goods, which I have come across mainly in England, was actually to give the material a wearing test. This was done particularly on raincoats. I know a firm in Manchester who employ a boy who has nothing else to do but ride a bicycle about fifty miles every day to a certain spot, mail a postcard there at the time he arrives, describe the weather conditions, and write a little novel about that. Probably wearing tests of this type are quite useful; perhaps more modern methods can be evolved for the purpose.

As far as Government methods are concerned, there are a number of them in use, but I assume that all of you who are dealing with Government contracts are sufficiently familiar with the requirements.

In conclusion I wish to say that the aspects of water-

proofing can only be tackled in a general way at a meeting where all the fibers and fabrics should really be mentioned.

DISCUSSION

Chairman Baxter: There is one method of testing you didn't cover. I run into it very frequently with some of the manufacturers of ski garments. They have bought up a lot of garden sprays from the hardware stores. The method is to fill the ordinary garden spray full of water and squeeze it as hard as they can up against the cloth. If the water goes through, the material does not pass in their estimation. That is rather a tough test.

Mr. Kappalman: Mr. Lindenmaier spoke about applying the waterproofing solutions to rayon fabrics which tended to shrink in storage, and the shrinkage sometimes amounted to two to four per cent. When fabrics are treated to reduce that shrinkage what happens to the fabrics we cut up and send out for cleaning or pressing, or something of that kind? Don't they shrink excessively, and don't you have just as bad a condition?

Mr. Lindenmaier: I am afraid that those fabrics which are sent out and dry-cleaned will shrink two or four per cent also. They won't shrink excessively, but they will shrink two or four per cent, of course. In some cases that might be rather awkward. In other cases it might not be so bad, if it can be adjusted again in the pressing or in some other way. It is natural that this shrinkage will only be prevented as long as the waterproofing agent is active in that material. Once you have removed it, shrinking starts again.

Mr. Kappalman: Is that waterproofing process being used to cover up defects in materials instead of shrinking the materials to the extent they ought to be shrunk before they are stored?

Mr. Lindenmaier: I hope it is not, but I wouldn't like to promise.

Chairman Baxter: I don't think that is the case at all. In most cases where that has been used, the object has been to finish the goods out to a certain width—thirty-eight and a half in the case of the dress goods trade. There are a number of fabrics that have a tendency to creep in, and the water repellent finish has been used so that they do stay out to the full thirty-eight and one-half, at least long enough to get through the cutter's possession.

That practice is quite common today and undoubtedly it has been one of the things which has helped to bring water repellent finishes very much to the fore in the last year or two.

Mr. Stefano: Has anybody developed or come anywhere near developing a water repellent agent that would stand up under dry-cleaning conditions?

Mr. Lindenmaier: That, of course, is the thing that everybody is working on, and everybody hopes that he will have it tomorrow. How much longer we have to go on hoping, we don't know. It is obvious that to get a product like that is the ideal thing. I don't think there is one chemical concern that is not working on it. It depends on who is going to get it first and how good it is going to be.

Mr. Zisman: In the earlier part of your talk you mentioned something about the bad effects of sulfate materials in connection with the use of the water repellent agents. It is quite a common practice in certain hosiery mills to use a filler such as barium sulfate, and they seem to get away with it in some measure or other. At least, they get some satisfactory results.

How would you size up that situation?

Mr. Lindenmaier: Strange to say, this very cloth here has some barium sulfate in it. It was not done by a one-bath method having the filling and proofing in the same bath, but you would naturally assume that if you filled this piece of goods first with anything that is liable to break down the bath and then take it through the proofing solution, some of the filling would be bound to come out and, of course, would upset the proofing bath.

I do know for a fact that goods are being finished like that. As a matter of fact, this piece of goods laying right here contains some barium sulfate, which was then run through a waterproofing bath, and the repellency is fair. There is about eight or ten per cent of artificial weight in the cloth.

I don't think there is any emulsion on the market which will stand the barium sulfate addition right in the same bath. You have to run it separately.

Mr. Zisman: I might say that that is just why I am asking the question here. It is the practice to run in the barium sulfate or a combination of chemicals that will produce the barium sulfate, such as barium chloride, in the same bath, where one thing is run in after another. Apparently there is not any very great trouble.

What I am wondering is, does that affect the waterproofing?

Mr. Lindermaier: It might.

Mr. Zisman: Of course, in that case they use a very small percentage of barium sulfate.

Mr. Lindenmaier: That is it. You have to keep within a reasonable quantity.

Some Problems in Printing and Dyeing and How They Were Solved*

BEN VERITY**

NATURALLY, recent problems and their solutions will be of more interest and use than difficulties that occurred a generation ago with colors that are now obsolete.

Indigosol Blue IBC—or Algosol Blue IBC—or Ponsol Blue BF Soluble—was introduced to the American dyers and printers about two and a half years ago. It yields a color similar in shade and composition to Indanthrene Blue BCS (C. I. 1114). It has only slight affinity or substantivity for cotton and this may cause difficulties in its application.

If it is mixed, for instance, with Indigosol Green IBA and cloth padded through the liquor, the Green will be absorbed more quickly than the Blue. This can be overcome in two ways—one is to strengthen the feed color with about 30 per cent more Green and about 5 per cent more Blue and then the shade will come fairly level. The temperature and height of the color in the feed box must be kept as uniform as possible and, if the result is not quite level, the feed tank can be further adjusted in the direction needed.

The other method—if the condition of the cloth and machine will permit it—is to pad direct to the nip and supply the color above the cloth to the nip with a small gear pump connected to the bottom of the box, the excess falling back into the box—the color being fed to the box by another independent pipe and the feed adjusted so that the level in the box is kept constant.

Another problem that presented itself was again a result of the low substantivity of the Indigosol Blue IBC. (I might here say the Algosol colors are identical with the Indigosols and are simply the same colors as the Indigosols under another name.) In drying a low count cloth in an Andrews & Goodrich Air Drier, the Blue IBC migrated and caused an undesirable uneven result.

To overcome this transference of color by capillary attraction, Gum Tragacanth was added to the color, but this did not improve matters. The next move was to sky the cloth about 40 yards after padding before going into the drier, or batching up on a roll. With this modification Indigosol Green IBA, which is very substantive, gave much better results and it also improved the Blue IBC; but the latter still gave imperfect results.

It was then thought that if Indigosol Blue IBC could be made more substantive by the addition of Glauber's salt, that it might dry satisfactorily and give a result free from migration. Fifty yards of a mercerized lawn was padded with the usual formula and another 50 yards was padded with the addition to the pad liquor of 10 per cent of Glauber's salt crystals of the weight of the liquor, both run into a box and then dried on cans. The trial with Glauber's salt showed a very marked improvement.

The next lot was padded with the color containing the Glauber's salt, run into a box and then—before drying—run through the mangle in front of the air drier, as the color had seeped down through the lawn, and from there direct into the drier and run at such a speed that the cloth came out barely dry. When this cloth was developed, it was found to be very level and quite satisfactory and showed no migration of color.

Hence I would suggest that when you have trouble from migration of color to add Glauber's salt to the padding liquor and sky before entering the drier and you will have much better results.

Also, if you wish to can dry the Indigosols, I may say that without the Glauber's salt it is not practical, but with it, it seems to dry free from the usual troubles. Large runs, however, have not yet been tried but from what I have seen I think that the results are very promising.

Another troublesome point in the application of Indigosol Blue IBC is its sensitivity to overoxidation. To avoid this one should not develop at too high a temperature and the nitrite of soda should be kept low. Though the goods appear to come out the correct shade at the end of the developing machine, if they lay in the box before soaping and there is some nitrous acid left in the cloth, it will tend to overoxidize in some places and become uneven. To remedy this have a soda ash solution sufficiently strong in the last box to kill any trace of acid in the cloth.

If goods containing animal fibers are uneven from this cause, the best way to correct the shade is to treat the goods with zinc hydrosulfite formaldehyde compound and acetic acid near the boil. One-half of 1 per cent of each will probably be sufficient. 0.1 per cent hydrosulfite powder and 0.1 per cent caustic soda can be used on cotton for the same purpose, but for mixed fabrics this is not suitable. If very much overoxidized more than these quantities may be required.

*Presented at meeting, Piedmont Section, Feb. 19, 1938.
**Carbic Color & Chemical Co.

PRINTING INDIGOSOL BLUE IBC

One superintendent said to me that this is a tricky color and I agreed with him. If printed with nitrite of soda it will come up in the laboratory or works' small ager probably all right. But in the bulk, it frequently comes out incompletely developed, especially where acetic acid only is used in the ager.

If printed with neutral chromate again the color is not completely developed. But the shade can be brought up by oxidizing *in a cold bath* with 5 lbs. of sulfuric acid and 2 lbs. of nitrite of soda to 50 gals. at 25° C.

The blue in the intermediate di-ester stage is fast to washing and even if your goods are finished, they can be brought back and fully oxidized and an unevenness of shade largely corrected—even if not fully so—by running through nitrous acid.

Hot bichromate and sulfuric acid overoxidizes Blue IBC.

Another undesirable result in printing is the difficulty of obtaining strong shades with Indigosol Green IBA on pigmented rayon employing the usual formula. A modification of the general method that gave excellent results is as follows:

Print 4 oz. Indigosol Green IBA with thickener, water and 6 oz. diethylene glycol per gallon of color. Dry, acid age 4 minutes, then oxidize in a nitrous acid bath in the open state, wash and soap in any way that is convenient.

Five lb. sulfuric acid, 2 lb. nitrite soda per 50 gallons cold water 25° C. will effectively oxidize the color.

The Blue IBC was run the same way, but diethylene glycol does not seem to be necessary with this color. This method has not been employed as far as I know in practice as yet.

AN EXPERIENCE WITH CHROME COLORS ON SILK AND RAYON

At one time a customer wanted deep full shades of green, blue and purple or rayon. We sent them the colors and mordant with instructions how to dye same.

They started dyeing on the jig, expecting no trouble. When the first shade came out poor, the second worse and the third was mordanted only, they sent out a call for help. We worked in the laboratory and fixed all three shades to their satisfaction and then left the works after indicating the procedure to be followed, expecting the goods to come out satisfactorily. A month afterward I asked what the final result was and, much to my surprise, received word that they were no good and that they had gone back to vats. They repeated the trials, however, in the laboratory and found them all right. What was wrong then up to that time, was a mystery!

About a year after this experience we had occasion to dye these same colors on silk. They were dyed somewhat differently, the color going on first and the mordant last.

The mordanting was supposed to be done at 195° C., but in running even with the mordant in the jig at the boil, the color did not develop as it should. A trial was made by stopping one of the seams in the jig liquor for ten minutes at the boil, this developed the color completely and at the same time indicated what was wrong, and also showed what course would be necessary to obviate the difficulty. Subsequently the goods were run on a regular silk dye beck where the material could be kept longer in the bath at 195° F. and they came out all right.

On the jig, the goods coming out of the liquor cooled down by evaporation and the temperature of the batched roll was evidently below that needed for the reaction to take place; and that no doubt was probably the explanation of the first failure, as they were processed on the jig.

DIFFICULTIES OF DRYING NAPHTHOL AS PREPARED GOODS

When one pads Naphthol AS on eighty square cloth or broadcloth and drys on cans and develops the color, one is apt to find that the dyed cloth shows scrimp marks at irregular intervals and longitudinal in relation to the cloth.

I have heard of different ways of overcoming this which I pass on to you without guarantee:

First Method: If you have a long set of cans, run the first section cold, the second section warm and the last hot, and bring off just dry, or barely so.

Second Method: Run the goods and only half dry, and then fully dry the second time.

Third Method: Run the cloth through a water mangle as tight as possible to draw in the cloth before preparing.

Whether Glauber's salt added to the prepare would overcome the difficulty or not is a question. It does with Indigosol Blue IBC, so it might with Naphthol AS, though I have never tried it—I pass it along merely as a suggestion.

The best method, of course, to overcome this defect is to use an air drier, such as Andrews & Goodrich machine.

VAT DYEING

It was found that when we oxidized vat color plain shades on the jig with bichrome that we did not get level results with some colors.

Some years ago Mr. Hebden gave a talk in Providence before the Rhode Island Section of the A. A. T. C. C. on the chemistry of vat dyeing, and he showed how he could practically exhaust a Ciba Blue 2BD vat dye bath in a Franklin Process machine by means of the following procedure. We will assume for argument that we have dyed a batch of yarn with Ciba Blue 2BD and attained an equilibrium and that there is 4 lbs. of caustic soda left in the dye liquor. Mr. Hebden then added enough bicarbonate of soda to neutralize half of the caustic soda and then dyed 15 min. more to another equilibrium, then neutralized again half of the 2 lb. of caustic soda and dyed another 15 minutes, and then added another lot of bicarbonate of soda to neutralize half of the last 1 lb. of caustic left in the bath, then dyed to the final equilibrium.

The dyestuff firms said Ciba Blue 2BD could not be exhausted. He practically did it by this means. If I

remember correctly, the yarn was washed with a cold bicarbonate solution and then oxidized with air.

The purpose of the bicarbonate is to form the free insoluble leuco body and thus prevent any being washed off the fiber before oxidation.

We applied this method to the vat dyeing of plain shades, running the vat-dyed cloth direct into a cold bicarbonate of soda solution and giving two ends and then rope washing in *cold water* to oxidize the color. Ninety-five per cent of our vat plain shades were never rope soaped. If the colors were such that they needed to be given a good hot soap bath to develop the shade, we put the material through the steam box or vat ager, and that would change the shade at half the cost and with less risk of dirt and stains which you might get if rope soaped to obtain the desired change of shade.

DEVELOPING PRINTS THAT ARE UNEVEN

Sometimes prints come out of the acid ager incompletely developed—Indigosol O4B for instance. If printed with bichromate of soda 4 parts, Indigosol O4B 10 parts, ammonium chloride 5 parts, urea 3 parts and diethylene glycol 3 parts, hot water and paste as needed running through a solution of a mixture of one-half of 1 per cent oxalic acid and 2 per cent sulfuric acid at 120 to 140° F. will complete the oxidation. Copperas ferric nitrate is also used for completing the development of Indigosol O4B and other Indigosol colors; also sulfuric acid and bichromate of soda. But the latter has to be kept at 180° F. to completely develop the O4B.

Nitrite of soda is sometimes used in printing Indigosol Blue IBC and, if it is run afterwards through copperas ferric nitrate to develop the blue and other colors, the Blue IBC will be overoxidized if the temperature is too high.

To avoid this, where there is no objection to its use, add as much ammonium chloride as there is nitrite of soda and this will destroy the excess of nitrite so that the color will not be sensitive to a high temperature of the copperas ferric nitrate, and also will practically fully develop the color in some acid agers.

FASTNESS OF INDIGOSOL GOLDEN YELLOW IGK

This Indigosol is not as fast to boiling soap as one would wish. If, however, an Indigosol color is required that will be faster to soap, 13 parts of a mixture of 2 parts Indigosol Yellow V and 1 part Indigosol Golden Yellow IRK will give the same shade as 5 parts of Indigosol Golden Yellow IGK; and the mixture will be much faster to boiling soap and about the same fastness to light.

This applies to dyed shades as well.

DYEING PIGMENTED RAYON

In dyeing pigmented rayon and spun rayon one is confronted with a fiber that must be handled much more carefully than cotton to obtain a good level result.

If you padded an Indigosol on pigmented rayon and pressed on the batched roll before developing, the chances are that the developed shade would be marked where pressed, the color most likely lighter or darker on one side than the other.

To overcome the characteristic difficulties the following procedure will give good results where a continuous machine is not available:

Pad to nip once and batch up, then bring back and, without drying, pad again to the nip, using a rubber-covered mycock expander with a gentle pressure to keep out scrimps on the batching roll. Then avoid all contact with the padded roll and lift and support only by the shell, and put on sticks on the jig in the reverse manner, and run the cloth direct into the acid without touching the small rolls; and batch up through the acid at 25° C. on the other side, as is usual, and give one more end in the acid. Then wash and soap as usual.

A dyer sometimes has to discharge plain shades and redye same. If it happens to be a fast Naphthol color, the edges are apt to remain more or less colored and, if redyed, the resulting shade would have darker selvedges which would probably make the goods seconds.

A cheap arrangement for obviating this difficulty is to alter one or two old jigs in the following manner:

Put a batching roller with necessary drive on outside of jig in center of jig box so that when cloth is batched up on this roll it will revolve in liquor and the level of the liquor need only be on a level with the low side of the bearing or journal of the batching roller inside the jig—the cloth being run backward or forward on this arrangement, will discharge the selvedges as well as the balance of the cloth.

Again one sometimes dyes Naphthol color and finds the dyed goods are full of dead cotton. Some of you may not know that if you then mercerize this dyed cloth, that the goods will be made practically free from this defect; and the shade in many cases quite equal to the color obtained if dyed on mercerized cloth in the first place.

In printing a fine resist for Aniline Black on a more or less soft fabric and then padding black, you have probably tried various expedients to process the goods satisfactorily. One day a friend of mine was showing me a fabric used for workmen's shirts and, knowing the difficulties of making such goods, I told him frankly I could not do it and asked him how he had succeeded. He told me "No" when I asked him if he had calendered the goods before printing. It would not do the trick. But if you friction calendered the goods before printing they would come all right.

When we were dyeing more than a million yards of plain shades a week at the American Printing Company during the war, we were confronted with the problem of how to keep the continuous dyeing machines running without having to stop to run patches, when we made up new batches of color using a variable wash liquor and other odd lots of khaki color to make up a batch. We did it by a

spot patch method. The man who made the spot patch did it in such a manner with a small piece of cloth fourfold in the palm of his hand that this result would be the same shade as the goods running in the machine. This saved time and materials.

A similar method of matching shades with Indigosols is very useful. The color is dropped *past* the cloth and the excess runs away as the fabric fourfold is held in an almost vertical position, then the patch is rolled up and twisted and squeezed on itself and then developed wet, or dried first—according to the method in use, for processing the shades wanted.

Recently I had the following experience, which combination of circumstances may never happen again, but it will illustrate to you, how knowing the characteristics of the individual colors, and mechanical conditions involved, enabled the problem to be solved.

A grey on a rather heavy piece of cloth was being dyed with Indigosol Blue IBC and Indigosol Brown IBR, and it came out barred across the pieces. It seemed lighter at regular intervals, the shades blending one into the other so that you could not measure a repeat of one mark, so what seemed to be the center of each light band was marked with a pin and the distance between six such pins measured and the repeat was about 12½ inches. Now the circumference of the rollers in the dyeing machine was 12 inches and, as the cloth had been stretched, this showed that probably the rollers had something to do with it. The definite repeat naturally indicated mechanical trouble.

The variation in shade had been proved to be not due to chemical faults, such as overoxidation, by testing with zinc hydrosulfite formaldehyde compound and acetic acid. It was learned that some of the rollers in the machine between the nip from the acid developing bath and the padder were bent and also there was a roller 12 inches from the pad nip over which the cloth passed at right angles. The lobbed or bent rollers as they revolved would cause a slack or tight tension on this roll over which the cloth passed before the excess color between the fibers could be absorbed by the cloth.

So a trial was run, omitting this roll close to the nip, the first roller over which the cloth was passed being 8 to 10 feet above the nip. The result was that with this change eighty per cent of the barred effect was removed. It was still there but much less prominent.

The idea that the particular substantivity of the colors being used had some bearing on the effect produced, was evidenced by the fact that with other shades of Indigosols, run exactly like the cloth over the roll near the nip, were all right and showed no barred effect.

Though the effect was evidently produced mechanically, why did this particular shade give the barred effect and other Indigosols did not?

It was suspected that the very low substantivity of the Indigosol Blue IBC as compared with the Indigosol Brown IBR might be the cause.

When the pressure came on the roll near the nip the Blue IBC was pressed to the outside of the cloth but the Brown, having been more quickly absorbed by the fabric on account of its greater substantivity, was not there to go on with the IBC. Hence the change of shade was caused by the combination of lobbed roller and different substantivity of the two dyestuffs.

If this reasoning were true, then adding Glauber's salt to the color to make the blue more substantive might remove the defect.

It did.

I once went into a calender room in Canada and I noticed some marks on the metal calender rolls, and I asked the workman what caused them, and he told me that if a piece of metal got into the cotton or husk bowl that it marked the metal roll at every revolution and, if it ran long enough, it would soon make a complete visible circle on the metal roll.

When I was at the American Printing Company, occasionally we had damaged cloth and I well remember a lot of grey cloth was cut and no one had been able to locate the trouble. It was suspected that this damage came off some of the water boxes, through which at that time we ran the grey back cloth from the printing machines. Remembering this ring effect on the calender rolls, I said to one of the men: Give me a search light. And I started to look at every copper or brass roll in the 42 water boxes for a fresh or bright ring mark. When I had gone about one-third of the way, sure enough I saw a very pronounced ring mark on the copper draw roller.

When the smooth cotton lapping on the top bowl was examined by feeling with the hand and also by looking at it, nothing could be felt or seen that would injure any cloth going through the nip.

But the evidence of the ring was so marked that I asked that the cotton lapping be pulled off. Then the cause of the damage was revealed—a broken tooth from a gear had in some manner become imbedded in the cloth. It was so large I could never understand in the first place how it came to be there and, in the second place, why it was not perceptible on the face of the lapping.

DISCUSSION

Chairman: I am sure Mr. Verity succeeded in solving his own problems very well, and I am sure he will be glad to try solving any you may have to present to him. Are there any dyeing problems which you wish to pass on to him?—Your samples here of scrimps interest me (not that we ever have had any). I believe scrimps are due to the cloth pulling up on the cans, that is, the light places are caused by the part against the cans drying first, and pulling the color in solution away from these light places?

A: Where it is puckered on the can, the part on the can is dry, the other part is not, and the light part is due entirely to that puckered part on the can.

Chairman: Have you ever heard an explanation of this trouble, that it is due to the fact that the cloth gets on

the cans and on the drier before it is thoroughly wet out? The solution is held in minute particles or drops between the fibers and if some time is allowed for that to be completely absorbed into the fiber, that scrimp will not show to so great an extent.

A: No, I do not think that is the answer, for those two pieces were run into a box and had plenty of time to be thoroughly saturated with the color, and the only difference was that one had Glauber's salt and the other had not. I was watching it closely because I wanted to see if the Glauber's salt would prevent the scrimps showing and it did. One gentleman told me this, that in the old days when cloth was woven without automatic looms they never had that puckering on the cans, but I think that it might be that they did not use things that showed it. Today you will find that many grades of cloth will give you that pucker.

Chairman: We have had some experience which shows that if a solution thoroughly wets out a fabric, the scrimps would be much less. By improving the wetting, the drying has been improved.

A: It might be, in that case, that the solution had been incompletely absorbed by the fabric, but you see these were run so that the excess of liquor would be absorbed before it reached the drier. If you pad a direct color, and run the cloth directly on to the can, then it will blister, but if the cloth has absorbed the dyestuff it won't blister. It takes time for the material to absorb the color. That is why when using the air drier with Indigosol you will get a much better result if there is some skying between padding and drying.

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New Developments in

Dyeing and Finishing Machinery*

GEORGE LANE**

IN the past few years it became apparent to some textile machinery engineers that changes in the present processing machinery would be necessary to meet the requirements of the trade, for the successful processing of the now popular rayon fabrics. Of course, there are quite a number of machines used in the processing of cotton or silk that can, and are being used to good advantage for the dyeing and finishing of woven fabrics, however, it is not my intention to talk of these machines that are so well known in a general way to the dyeing and finishing industry. I prefer, at this time, to try to explain to you from a mechanical point of view, combined with an observance of processing that I have been fortunate to obtain during my many years of association with the dyeing and finishing industry, some of the new developments in this field.

I have selected three machines, namely, the continuous scouring or boiling-off unit, the constant speed tensionless jigger dyeing machine, the decatizing or decating machine.

The scouring or boiling-off of rayon or silk woven fabrics has been quite a problem confronting the machine designer. In the past decade several types of machines have been used for the scouring and washing of rayons of the crepe or flat variety continuously and progressively but very little headway has been made for boiling-off silks by machinery continuously and progressively, due to the time element required to remove the natural gums or sericin, and also, due to the fact that the only machinery available, necessitated pulling the fabric warpwise over oval or round reels and transferring the goods from tank to tank, or compartment to compartment using a strong spray method or manual means to completely submerge the goods below the liquid line. This method often resulted in bruised and chafed goods. When rayon and acetate crepe mixtures appeared on the scene a few years ago, it gave the dyers quite a problem. That is, they were troubled with crack or break marks, the name they are commonly known by. Chemicals alone were of no avail to solve this problem and it was up to the machine designer and engraver who came to the rescue with the embossing machine and the engraved crepe pattern and gave temporary relief. It was at this time that the machine designer realized the necessity of a scouring machine to handle goods.

To accomplish this it was necessary to design a wetting out section of a machine. The modern section is known as an initial wet treatment machine comprising a dual tandem let-off, driven dry goods draw rolls, driven wet goods submerging cylinder, combination motor driven circulating pump and cascade, driven submerged conveyor, driven take-out reel or pleater, all mounted on and in a steel tank.

The follow on scouring or boiling-off machine is comprised of a dual driven endless conveyor seven tiers in depth, variable speed drive, driven take-out reel or pleater, all mounted on and in a steel tank. This is only a brief

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**Van Vlaanderen Machine Co.

description and is used to give you a mental picture, as I now describe why this type of machine is preferable in my opinion, to any other.

The goods are wet out evenly in full width form while being carried on the surface of a driven cylinder and completely submerged, finally resting on a travelling conveyor located immediately below the cylinder. The conveyor is equipped with a variable speed drive to allow accumulation of the goods as desired; and the goods are free to shrink naturally both in warp and filling. It is very important that the goods are wet out evenly and carefully. When the goods are in a wet state in the machine they are at no time subject to pull or undue strains either in the warp or filling.

The goods then proceed to the boil-off unit. The dual endless conveyor method is unique and versatile, as it allows the goods to accumulate for time-process, at the same time carrying goods buoyantly through a liquid the goods being completely submerged at all times, also turning over the goods at least six times during one continuous passage through machine, thereby eliminating the possibility of imperfect scouring, and allowing the goods to obtain full swelling action of the fibers which is so essential to rayons and kindred goods. Approximately 80 per cent of crepe qualities can be processed on this machine.

A continuous circulating system of liquid through the tiers is maintained by means of a centrifugal pump working in conjunction with a closed heater to obtain a constant temperature in bath, without diluting the bath with condensation from the steam. Provisions are made for automatic thermostatic control when desired. An ingenious mechanical control method is incorporated in the main driving mechanism to compensate for the various weights or qualities of goods carried between the dual conveyors. For instance, if a light weight 10-lb. cloth is being processed both the intake and take-out reels or pleaters are operating at maximum cloth speed the conveyor is travelling at its minimum ratio speed and when a heavyweight 40-lb. cloth is being processed, both the intake and take-out reels or pleaters are operating at minimum cloth speed the conveyor is travelling at its maximum ratio speed. In other words the same weight of goods is carried per yard of conveyor irrespective of the yardage of the goods. Any infinite cloth speed between minimum and maximum is controlled by a variable speed drive 1 to 4 ratio.

This machine is equally good for boiling-off silk, continuous saponification of acetate and practically all operations which require time process, careful processing and full natural shrinkage.

While on the subject of careful processing, I would like at this time to describe a machine for dyeing flat goods; a machine which has made rapid headway in the past few years. As a matter of fact, I believe it to be the outstanding contribution, as far as machinery is concerned, to the dyeing industry in the past thirty years. I refer to the tensionless constant speed jigger. No one can deny the fact that mechanically it is the last word in modern machine design, with individual vertical motor drive that prevents water or moisture accumulation in the windings, the main drive running in a bath of oil thoroughly sealed, all bearings above the drive supplied with oil by chains from the same source. Free-wheeling brakes which require no attention when once set, totally enclosed driven let-off and take-up, stainless steel tank, stainless brackets mounted on framework, free from tank, stainless steel immersion rolls and roller bearings, overflow troughs and foot operated plug. Returning to the main drive, the construction is entirely different from the conventional type jigger inasmuch as both batch rolls are driven simultaneously whereas in the conventional type jigger, the batch rolls are driven alternately, one batch roll always acting as a tension controlled un-batch idler roll, using the goods as a belt to pull it around thereby subjecting the goods to irregular tension strains caused by variations in speed, due to the driven batch roll of goods increasing in diameter which in turn increases the speed of goods through the bath and finally the goods pulling the tensioned controlled un-batch idler roll.

This condition cannot possibly exist in the tensionless jigger because both batch rolls are driven simultaneously and differentially creating the tensionless constant speed features that are practically fool-proof.

As this machine is equipped with brakes on the batch rolls, always keeping in mind that the unbatching roll is driven, at the same time as the batching roll, and that a definite relation exists through the medium of a differential drive: Two helical gear drives and two chain and sprocket drives and when a braking action is applied to the driven unbatching roll, taking up the small amount of lost motion that exists in gear drives, it is then when this drive demonstrates its infallibility, its protective action to the goods. If for any reason an operator should apply more brake than necessary on the unbatching roll to keep the goods taut while passing from batch to batch, the braking action would act directly on the driven unbatching roll and should an excessive braking action occur an overload would be thrown on the motor, no strain can possibly be put on the goods, for as I have said before, both rolls are driven simultaneously thus protecting the goods from hazards that are always present in the conventional type of jigger.

Another excellent feature that can be incorporated in this type of jigger is the automatic reverse and stop motion. This feature is an electro-mechanical device that allows a roll of goods to run from batch to batch, alternately as many times as required without attention. This feature is especially used for scouring or bleaching where quite a number of ends are required. The setting of the automatic reverse and stop is very simple and requires only a moment to adjust. The brakes are of the free-wheeling type and require no attention after they are

once set. Here we have a machine that is constant speed, tensionless, automatic reverse, automatic stop, surely a remarkable accomplishment in machinery design. This machine gives excellent results on acetates and other synthetic fabrics.

As my last subject I will speak on improvements that have been made to the decatizing or decating machine in the past few years. Probably the most important improvement made to the decatizing machine is the addition of a perforated cylinder to replace the conventional wood roll that acted as a storage and re-roll drum for the blanket. This improvement made it possible to utilize the existing vacuum pump to remove the surplus moisture from the blanket, so that the blanket will always be in uniform condition, and not become overloaded with moisture, a condition that has a tendency to rot and shorten the life of a blanket, and also give an inferior finish to the goods processed. It is probably a well known fact that decating improves the color, hand and finish of rayon, acetates and other mixed fabrics but in order to do a first class job, and do it consistently, a machine must be capable of sustaining quick change of temperatures, there should be—a non-rusting cylinder shell to prevent rust spots from ruining blanket or goods,—a large diameter cylinder to reduce the number of cloth layers for quick steaming and quick cooling of goods after steaming,—a large vacuum pump to assist in quick cooling of goods and removal of surplus moisture from blanket and all these features are found in the latest type machine. Free-wheeling brakes are also improvements added to both the steaming and blanket cylinders, enabling brake to act only when the cylinder is rotating in the let-off direction. The slip belt take-up is a decided improvement over the positive batch take-up, for the operator may wind a loose or tight roll of goods at will whereas with the positive batch take-up he had no choice and the roll was usually batched tightly.

In practice the fabric to be decatized is rolled together with a blanket in combined form on the copper perforated cylinder which has been previously covered with approximately twenty layers of fine sheeting that has had all the sizing removed from same. The blanket should be made of the best grade cotton and should be steamed and vacuumed several times on cylinder to condition it, before rolling in the fabric to be decatized. This is particularly so when the machine has been out of operation for a time, but not necessary when in constant operation. The steam is forced from the interior of the perforated cylinder through the various layers of cloth giving off latent heat and moisture making the fabric plastic. As soon as the steam appears all around the cylinder, the steam supply is shut off and the suction of the vacuum pump connected by a three-way valve is immediately set in motion, drawing the surrounding air through the various layers of cloth and creating an atmospheric pressure on the blanket against the fabric while same is in a plastic state, flattening out any breaks or cracks that may have been in the fabric. The fabric is also set into one uniform surface by the cooling action of the air which action also removes excess moisture and thoroughly conditions same.

Sometimes unevenness in crepeing usually causes the rayon fabric to appear unevenly dyed and decatizing evens up the face of the fabric and gives the cloth its uniformly dyed appearance. In any event, a decatized fabric is a better fabric and in a good many instances this processing sets fabrics so that no further shrinkage takes place after the final processing.

DISCUSSION

Chairman Baxter: Thank you, Mr. Lane. I am sure there are some questions that some of you gentlemen present would like to ask Mr. Lane at this time.

Mr. Lane: I have spoken from a mechanical standpoint and I hope some of you gentlemen didn't feel that I was too mechanical. I don't profess to be able to answer any questions relative to chemistry or anything like that, but I will be glad to answer some mechanical questions if I possibly can.

Mr. Chaky: I should be the last one to oppose Mr. Lane's views. I have been working the so-called tensionless jigs. In fact, I was one of the first ones to work it. All I have to say is this: the word "tensionless" is rather a misnomer for the simple reason that you cannot run any kind of goods on a jig of any type without tension. It is only natural that it is going to sag them, without any tension, and it is going to slide off either one side or the other of the jig. Nevertheless, I must say that of all the jigs, his jig, has the minimum tension in running cloths. It is excellent, as far as I know, especially in dyeing acetate rayon piece dye goods.

As far as the continuous boil-off machine is concerned, there are again quite a few problems to overcome, up-to-date mechanical problems that do not touch the chemist but do touch the dyer, if he runs a mechanical boil-off machine of that type.

It is entirely different to run a whole count woven fabric such as 68, 44, 72, 48 and so on, but as we go up in the taffeta line to the higher count—let us figure 110 by 50—we are going to run into difficulties at once. It seems to me that you can run lower count fabric without any creasing, but if the roll is not properly wet out, and preshrunk, with the sizing in it, and you go into a continuous machine, the shrinkage will be rather sudden towards the filling direction, inwardly, and it will cause streaks and cracks in the goods all the way through.

The only way that can be overcome is to pre-wet the goods entirely before you run into a machine like that. Then I couldn't tell you what the results really will be because I never ran it that way.

This whole proposition is hanging in the air, as far as I know. I trust and pray to Providence that Mr. Lane can devise a machine that will overcome these defects, and if so I am going to draw some of the money out of my bank and buy one, myself. But up to date I haven't seen

one yet that won't cause crack marks on even unsized goods that has been run through a machine. We all know it—even on satins, even on jig dyeing. You couldn't run into scouring liquors of any type, even on a high count taffeta or a high count satin. It is only natural that on the other end it is going to crack and show wrinkle marks, and as long as the count goes upwards it will show up even in dyeings as regular crack-marks. In acetates it is going to show dark lines which will, to all appearances, look like a dye streak. However, it is not. It is simply a matter of cracked filaments on the yarns dyeing a little darker which appear as a streak.

If you look on it overcast you won't see that, but if you look straight across the light you will see the cracked filaments.

All these are the facts of a boil-off machine that Mr. Lane happened to mention and I think I have spoken about the jig. I happened to run the machine more than six or eight months. I had no defects of any kind, no troubles of any kind. However, I had one trouble. That was the human element. I happened to quit the place where I had run these machines and another man came in, and he experienced endless troubles. So naturally I came to the conclusion that the trouble has not been with the machine, but with the man.

You see, these machines couldn't be run in the old haphazard fashion, the slambang fashion, like the other machines. They are more delicate. They require a man who knows a little bit about machinery and who is going to be careful about his work.

That is the only thing I can say about the machine. I have run it. Others have run it, and the man who knows about machinery is going to get excellent results. If you have any troubles with the so-called tensionless machines, you ought to change the man who runs it.

Mr. Brosnan: In connection with the remarks of the last gentleman, I can say one thing: I had a Christmas present of a machine, one of these boil-off machines, and on heavyweight fabrics, as heavy as 48 pounds to 100 yards in a conveyor type machine, we have been able to run them successfully without crack marks showing, but that has been on spun rayon goods, not on filament rayon. We have run a lot of filament rayons through there, up to about 92/68, without trouble, but I would be scared to run anything higher than that in the filament range in the conveyor type. But as far as the weight goes, with the variable speed arrangements that are on this new boil-off machine, and the way you can slow down your delivery and your conveyor, we have been able to run successfully, as I say, fabrics as heavy as 48 pounds to the 100 yards, which is almost an eight-ounce fabric. That particular cloth is 80 per cent spun rayon and 20 per cent spun wool, printed together.

So far as the tensionless jigs go, I agree with this gentleman over here; that they need tension. In other words, tensionless jigs are to a certain extent all right, and then you go beyond that, and you wish you had the tension. In fact, some of the jigs I have have that trouble: I can't get tension enough on tensionless jigs.

Chairman Baxter: You can still tie a leather strap around them. It has been done before.

Mr. Brosnan: On the particular ones I have you can't do it.

Mr. Lane: I appreciate very much the remarks of my friend in the rear there, the first speaker. I may say that he was probably one of the first men or one of the first gentlemen that we had to do some experimenting for us on the tensionless jig. I learned a whole lot from this gentleman and I appreciate very much what I did learn from him, but I do not agree with him when he says that the jig is not tensionless.

I claim that with the class of goods that is dyed on a jig, the jig is tensionless for the simple reason that because of the construction of the jig—both rolls being driven—the braking action does not come on the goods, it comes on the machinery; and that, as I mentioned in my paper, if an operator does put an excessive amount of tension on the batch roll, it goes directly on the machinery and not on the goods as it does in the conventional type of jig. The braking action on a regular type of jig passes through the goods, the tension applied passes through the goods, to the unbatching roll, and necessarily puts on tension.

Regarding the statement that they would like to get more tension on tensionless jigs, of course any type of goods that requires tension should not be put on a tensionless jig. That just bears out the statement that I made, that the jig is tensionless. Mr. Brosnan brought out the fact that he wished he could get more tension on it, but he finds that he cannot do it. That proves it is a tensionless jig as far as tension goes.

When we use the word "tension," we mean that we do not stretch the goods unduly, and if the goods are dyed on the jig, that they will come out at the normal yardage. That is an explanation that I can give for the tensionless jig.

In reference to the boiloff, the first gentleman who spoke mentioned taffetas. In my paper I mentioned the fact that the machine was good for crepes and would process about eighty per cent of crepes. I didn't even give the machine full credit for doing all crepes, because there are some classes of crepes at the present time that do not respond to this particular type of machine—crepes such as alpacas, for instance. I would not recommend putting an alpaca on that machine, not right away—not until we have found some other way of wetting it out, scouring, and one thing or another. That will come along at some future date, I don't know when. I am working on it and I imagine there are other engineers in the textile line that are also working on the same thing. It is a big problem. There are plenty of dyers who would be glad to have a machine on which they could process goods like alpaca

and the alpaca family, instead of having to do it in the old fashioned way, by hand.

As I say, for the experiments that we have made at different times, we are greatly indebted to the various chemists and dyers who have assisted us. We cannot do this all ourselves. We have to take a piece here and a piece there and ask a fellow to run it for us and give us his opinion. Then we work from that. We must have cooperation from the dyer, the colorist, and the chemist.

Mr. Barber: Because of the fact that you have increased warp threads, as the gentleman said, to the inch, and have a high pick, then your warp threads become tightly bound by the taffeta weave, you cannot run your goods through this jig at the speed you would run a low pick fabric. It will have to be run slower so that there isn't too much of a set in shrinkage, because those warp threads are so tightly bound that they cannot adjust themselves by any change in shrinkage, because the picks won't let them.

Take a cloth that has 100 or 104 picks—weave as we call taffeta. That is going to leave lines, if you run it through too fast. You are going to get a fine crease, and that will be the end of it. You cannot get it out. It stays there.

And I think that is what Mr. Lane had reference to for the lower pick cloth—that the tensionless jig is a good thing.

Mr. Lane: Yes, I agree with you, Mr. Barber.

Mr. Chaky: Is it possible to design a machine—not one machine, but rather two machines—which would be a combination of a continuous boil-off machine and padding machine? If you had a greater dip in the pan, you could run your raw goods with the wetting agent right through the padder and then run it together when the two machines are synchronized to the boil-off machine. That would eliminate a lot of this sudden shrinkage and the goods would be proper for entering the boil-off machine.

Mr. Lane: Answering that question, I would say that it is quite possible to design such a machine. As a matter of fact, it is not necessary to design such a machine for that purpose because there are machines on the market at the present time with which you can pad goods, and in the event you need some time element between your padding and your boil-off, you have conveyors that you can put it on. Or, in some cases, they run the goods into trucks and then from the trucks they wheel it over to the boil-off machine, to allow a time element to take place between the respective machines.

As far as the machine is concerned, I don't know that we can improve upon that method at the present time. That is about as far as we have gotten with it. But as far as designing a machine, a padder to run in conjunction with a boil-off machine, that is one of the easiest things for us to do, because we already have the machines. But the question is, What kind of a job will it do? It is really up to the people who are handling it to allow some kind of a time element there between the padder and the boil-off machine, and, as I say, it is already being done through placing it in trucks and then allowing the trucks to wait probably a half hour, and then taking the goods directly over to the boil-off machine.

Mr. Brosnan: I think I can elaborate a little more on the tensionless jig experience, as I see it, for it is tied up both with the jig construction—the inability to get tension—and the fact that when a cloth is woven they undoubtedly put more ends in a dent in the selvage for strength than they do in the balance of the cloth, and with the tensionless jig the trouble is that you are, of course, trying to keep a straight batch, to prevent dark selvages and listed goods. So you want your batches going from beam to beam to be perfectly straight. My experience with the tensionless jig—they haven't all been Van Vlaanderen jigs; they have been other types, such as electric jigs—shows that the trouble is that the selvage builds up, and by the time you have six or eight hundred yards on a beam, your roll, instead of looking like a flat roll, looks like a spool; the ends are raised up and immediately inside those raised portions you have a little lake of dye liquor, and you also have a tendency to have crimps form in there.

On all-rayon goods the trouble doesn't seem to be as bad as on all-acetate goods or acetate warp goods. But no matter how tight a selvage you have on a rayon—a flat filament rayon piece goods—for jig dyeing, it seems to stretch or elongate with the tension that an ordinary jig gives, even the tensionless jig, and it doesn't give much difficulty in operating, or dyeing. But the acetate warp goods don't have the elongation or stretch that a viscose rayon does and it builds up, as I say. For that reason, although tensionless jigs are desirable on acetates to prevent pulling down the pickings and everything, at the present time they certainly give the dyer a little extra headache in the way of mechanical operation. As a result of my experience on tensionless jigs, I would like to see them so that you could put on tension when you want to and have them tensionless when you want them that way.

Mr. Lane: We will have to try to work that out. I don't know how we can do it at the present time, because they are just inverse to one another.

MEETING, MID-WEST SECTION

A MEETING of the Mid-West Section was held on May 7, 1938 at the Schroeder Hotel in Milwaukee, Wisconsin. At dinner 82 members and guests were present. Chairman Edward J. Siegrist presided at the meeting. Lake Wauwausee, Indiana, was chosen for the June outing. C. Scott Althouse of the Althouse Chemical Co., Reading, Pa., spoke on "Coal Tar to Dyestuffs", with assistance in demonstrations by Clarence Wille.

Respectfully submitted,

HERBERT W. TETZLAFF, *Secretary.*

Preparation, Printing and Finishing of Rayons*

P. J. WOOD**

QUALITY OF GOODS

A FEW years ago, the favorite all-rayon crepe fabric for printing was the 96/48 Canton crepe, 96 ends of 150 den. bright rayon in the warp, and 48 picks of bright 150 den. rayon with 50/52 turns of twist in the filling. Later came the Sand crepes 120/72 constructed of 100 den. bright rayon, both warp and weft yarns being twisted 50/52 turns.

Today the principal fabric in the printing field is the pigmented rayon French crepe. Originally, this fabric was made with 120 ends in the warp and 76 picks in the filling, the size of the yarn being 100 den. Recently, the construction of French crepe has been considerably changed, some of the lowest counts to as little as 76 ends in the warp. This change has resulted in presenting new difficulties to the printer, who is expected to produce as good looking a piece of goods from this cloth as from the former better construction. The cloth is not a crepe in the true sense of the word, as the yarn in warp and filling is not twisted. As mentioned previously, the Canton crepe has a plain yarn in the warp and twisted yarn in the filling. The Sand crepes and Mossy crepes have twisted yarn in both warp and filling but the French crepe yarns are not twisted at all. Probably a more correct name would be crepe finished taffeta. The crepy appearance is produced entirely by the process through which the goods are put during preparation before dyeing, drying and finishing.

PREPARATION BEFORE DYEING

After examining the goods to check the count, and filing a sample for reference, a sample is spotted with Iodine in order to determine if starch has been used in the slashing of the warp. If starch is present, it is advisable to treat the goods with a solution of one of the various amylolitic enzymes, the strength of the solution being regulated according to the recommendation of the particular maker. This is generally accomplished by passing through a quetsch or mangle, after which the goods are folded off into a box truck and allowed to stand for one or two hours. Some printers prefer to give this treatment to all goods, regardless of the fact that they may contain no starch. In some cases, a mixture of proteolytic and amylolitic enzymes is used. In any event, the passage through water at 120° F., which is the average temperature used, may reduce the amount of work to be done in the subsequent boil-off operation, and it undoubtedly starts the shrinking so necessary to the successful handling of this quality.

BOIL-OFF

1. Caustic Treatment

No hard and fast rule regarding the strength of caustic to be used can be given. This is a matter to be determined by experiment for the product of each manufacturer. In general, it may be said that the caustic strength varies from 2 to 8 degress Twaddel, the average strength being 4 degrees. However, it will be found that whilst the construction of goods from different manufacturers may be the same, the behaviour under caustic treatment may be entirely different. For this reason, the writer has made use of a simple method of determining the best caustic strength, as follows:

Four ten inch strips of the cloth are rolled, one at a time, around a paper tube and withdrawn from the tube in the form of a cylinder of fabric. These cylinders of fabric are dropped carefully into caustic of 2-4-6-8 degrees Tw. The action is allowed to proceed for the same length of time that the goods will remain in the causticising part of the machine in use in practice. They are then removed from the caustic, washed and passed through the regular boil-off in use. After drying, without tension, they are compared for shrinkage and feel and general appearance, and the optimum caustic strength thus found. The idea of having a standard length of fabric of ten inches is to make it easy to calculate readily the percentage of length shrinkage, one inch being 10 per cent. By rolling into cylinders on the paper tube, break-marks are avoided. If this is not done, the samples are so mussy that it is impossible to make a proper comparison. For the same reason, it is better to straighten out the samples after boil-off and before drying and pass them through a mangle or squeezer.

This preliminary test is recommended as it has been found that there is a deal of variation in the slashing compounds used in various mills.

Before the introduction of the modern caustic machines, the causticising of rayons was carried out in two ways.

(a) The goods were folded, sewed with six strings on one selvage, and suspended in caustic soda of the requisite strength for ten to twenty minutes, removed from the solution and washed.

(b) The goods are looped, sewed with six strings on one selvage, and handled as in method (a).

*Presented at meeting, Rhode Island Section, January 28, 1938.
**Royce Chemical Co.

(c) The goods are looped, suspended on bent sticks and given a couple of turns in the bath, to change the point of suspension, removed from the solution and washed.

(d) The goods are looped, immersed in the caustic in a laundry dash-wheel for ten or fifteen minutes, removed from the machine, straightened out by hand, and washed.

NOTE: Whilst this method was quite successful in the case of rayon cantons and similar heavier fabrics, it was too strenuous for the lower qualities of French crepes. It gave rise to too many break marks and frayed the goods.

Most of the present-day caustic machines are used in tandem with some form of continuous boil-off machine. One type consists of a simple iron tank fitted with rollers, a little wider than the goods to be treated. The entering end of the tank is fitted with an opening device to keep the fabric from creasing. A pair of squeeze rollers at the other end of the machine removes excess of caustic as the goods leave this part of the machine. The fabric is delivered on to a traveling net or into a jaybox, where it remains for a few minutes. The time it remains on the net or in the jaybox varies in different mills,—probably from five to ten minutes would be the upper and lower limits.

In another form of caustic machine, the goods are passed around a large metal drum in an iron tank. Half the circumference of the drum is immersed in the liquor. The drum carries the goods into the liquor in a very straight condition, without creases. As the goods are wound around the drum dry and with a little tension, which can be varied at will, the action of the caustic takes place gradually and evenly. After impregnation, the goods are either lifted out of the liquor by a reel and deposited on a traveling net or belt, or simply floated through the caustic to the other end of the tank, a distance of 12 to 18 feet, where they are lifted out by another reel and passed along to the boil-off.

2. Boil-Off Proper

In some print works, it is the custom to boil off French crepes in the open width through a five or six tank continuous machine. The machine is provided with squeeze rollers between the sections. The goods are led into the machine from the box trucks into which they have been folded after the enzyme treatment and are folded into trucks again after boil-off. In the case of a six section machine, having a capacity of 200 gals. per section, the bath is made up with 20 to 30 lbs. of TriSodium Phosphate plus 2 quarts Soluble Pine Oil in each of the first four sections. The fifth section contains hot water, and the sixth section, cold running water. If bleaching is considered necessary, this is conducted in another similar machine. The goods are now ready for dyeing.

When using this method, precautions must be taken to see that the goods are not subjected to undue tension. From time to time the bath is freshened with small additions of TriSodium Phosphate and Pine Oil.

On account of the liability of this method to stretch the goods, it is more usual to carry out the boil-off operation in one of the various forms of rope soapers. One of these, which is patented, consists of a tank divided into twenty or more sections and provided with two reels. In this machine, the goods enter the first two sections where they are treated with warm running water. In the next fourteen sections, they are subjected to the action of the boil-off liquor. The composition of this bath varies considerably in different works. Here is one which has given good results:

Volume of water in washer 4000 gallons.
Hardness of water 18-25 parts per million.
8 pints Hexa meta phosphate 30% solution
4 lbs. Soda Ash
20 lbs. Fatty Acid Alcohol
50 lbs. Soap 90% actual soap
8 pints Soluble Pine Oil
Temperature 180° F.

In the next two sections, the goods are washed with hot water at 140° F. A final rinsing in cold water in the last two sections completes the boil-off operation. A spot of phenolphthalein solution applied to the end of a piece as it comes over the doffing reel at the end of the machine should produce no pink coloration.

When only the higher constructions of French crepe were being printed, it was usual, in many plants, to loop these goods and boil them off in soap, suspending them on bent sticks in a 1 per cent solution of boiling soap (200° F.) for forty-five minutes to one hour.

Still another method, which was used for those better qualities, consisted in folding the goods and laying them carefully, without creasing, in a bath containing an enzyme at 120° F. for three hours, after which they were given a short boil-off in the dyeing machine, before the dyeing operation.

However, with the advent of the lower qualities, it was found that these methods did not swell the fiber sufficiently. Caustic accomplishes this.

DYEING FOR DISCHARGE

The choice of colors for dyeing goods intended for discharge printing is very important. It is equally important, in places where plain dyeing on rayons is also done, that certain dye tubs shall be reserved for dyeing goods for discharge. This precaution is necessary because some colors which produce excellent results in plain dye are not fully dischargeable. This applies particularly where the tubs are constructed of wood. Even after thoroughly bleaching out a wooden tub there is always a possibility that a slight residue of the former color may boil out into the dyebath and spoil the purity of a discharge dyeing. Where metal tubs are in use there is less trouble, although, even in this case, absolute cleanliness is all-important.

Probably the only really safe way to insure freedom from trouble of this sort is to use only absolutely dischargeable dyestuffs for plain colors too. In some print

works, it is the custom to use diazotized and developed for all colors intended for discharge. This method adds greatly to the cost. Generally, direct dyeing is used for the light shades, whilst dark colors are dyed with developed colors. The choice of dyestuffs is large, but the developers are confined to two, beta naphthol and phenyl methyl pyrazolone. There is a limited range of dyestuffs which can be aftertreated with formaldehyde which are also being used.

In diazotizing and developing, it is important that the goods be protected from the influence of daylight, which readily decomposes the diazo-body. This can be effected by screening the dyeing machine or the windows. One of the most modern dyehouses is provided with windows of non-actinic glass, which have proved to be very successful.

Light colors can be very cheaply dyed on the padding machine.

At the conclusion of the dyeing operation, the goods are rinsed thoroughly to remove any trace of developer. To insure that this will be done without any doubt, it is the custom of some printers to soap lightly or wash with a fatty acid alcohol. After this wash, some people like to add something to the last rinse water to help the penetration of the print color. This is either a soluble oil or a fatty acid alcohol or even sometimes either of these with addition of some glycerine. If the preparation has been adequate, it is doubtful if these precautions are necessary.

After the last rinse, the goods are whizzed, opened and dried. The drying is best done on a loose dryer, in order to give the goods every opportunity to make the fullest possible shrinkage. Then they are tentered to remove creases, and are ready for printing.

PRINTING

Probably the commonest way to print both white grounds and discharge on rayon crepes is to print with Vat colors. The choice of a thickener for this work is important. Mixtures of various dextrines and British gums, with or without starch, have been used. The main requirements for an ideal printing gum are:

1. Good mark.
2. Penetration.
3. Color yield.
4. Good flow.

The cost of the thickener is also important, but to produce the best work, it must possess the qualifications mentioned.

The additions to the printing color are Sodium Sulfoxylate-Formaldehyde and Potassium Carbonate and glycerine, and, of course, the Vat color. The proportions of these ingredients vary in the different shops widely. A very good printing gum is on the market, which contains:

12% Sodium Sulfoxylate Formaldehyde
8% Potassium Carbonate
—— Glycerine

This has proven to be a very useful gum for most colors. In some cases it is necessary to increase the amount of potassium carbonate for certain Vat colors.

The practice of adding glycerine varies greatly in different places. Good results are obtained with as little as 3½ per cent, then again some people use as much as 6 per cent. The average is probably somewhere in the neighborhood of 4 per cent. The amount of glycerine depends on the condition of the ager. If it has a good proportion of moisture in the steam, the glycerine content of the printing paste can be lower. It the steam is very dry, it must be higher. The correct amount to use must be determined by experiment.

After printing, it is customary to pad the goods with a weak oxidizing agent. This is done either on a printing machine with a fine pin point roller, or with a three roll quetsch, running the goods through the top two rollers. A small amount of Textile gum is used in the padding liquor. This makes the liquor furnish better and also stiffens the goods slightly, making them run much straighter in the ager and eliminates creasing and, consequently, mark-offs. The oxidant also eliminates facing and the finer doctor streaks.

The ager is a frequent source of trouble. It is impossible to lay down any hard and fast rules for the conduct of this operation. In general, it may be said that the moisture content must be sufficient to give a good discharge and reduction of the Vat color, but not enough to spring the color or produce water drops. In order to avoid mark-offs, it is good practice to thread the goods through every other roller for the first six rollers, if ager is long enough. It has been found that the period of ageing is best at about 6 minutes, for Vat multi-color prints. For white only, this time can be reduced. Whites are generally mixed with more glycerine. This makes them more subject to mark-offs. In this case, it is well to reduce the moisture in the ager. It is a good plan to keep one ager for whites exclusively, where an extra ager is available. In this way, the time of ageing can be shortened, and if thought advisable, the whole ager can be threaded up every other roller. This method prevents the steam overheating between the close folds of cloth, as it will do, especially if large amounts of glycerine are used in the color. The glycerine has an avidity for moisture and quickly extracts the dampness from the atmosphere of the ager, leaving it too dry for best results. It is also possible that the extreme dryness of steam may yellow the whites.

WASHING OF VAT PRINTED RAYONS

The washing operation should closely follow the ageing. Leaving goods after ageing, either in box trucks or rolled up, for any length of time is not good print works practice. The sooner they are washed the better. A short run through warm water helps to soften the gum. If this part of the washing machine is arranged so that the water is constantly changed, better results are obtained. In the first place, the water does not become fouled from excess

of color washed out, which will affect medium and light grounds. In the second place, fresh water flowing in carries a certain amount of oxygen, which helps start the oxidation of the reduced Vat colors. The goods are then lightly soaped at about 140° F., rinsed in warm water and finally in cold water.

In some works, it is customary to wash with a small addition of sodium chromate in the first water after the warm rinse in the first box. In other places, an addition of an oxidizing agent is made to the soap. These additions are unnecessary in the case of simple white discharges. In washing white discharges, it is necessary to wash off any excess white discharge paste adhering to the goods, in order to leave them in a soft condition and so that the sticky mixture will not mark off on the calender, if it is found necessary to use this machine. In order to deliver the goods in good soft condition to the finishing room, some printers have a habit of adding a softening agent to the last rinse water. This method is not to be recommended, as it is very hard to make satisfactory arrangements for feeding in the softener so that it will be evenly distributed throughout the goods. Also, it is doubtful if real economy results from applying the softener at this point. Most softeners will cloud cold water and make it impossible to judge if soap is all eliminated. After hydro-extracting in the rope, they are opened and dried in a loose dryer, to retain maximum shrinkage.

FINISHING

If the goods are folded into a box truck from the drying operation, it is preferable to roll them on a shell before tentering. There are two good reasons for this preference. Firstly, it is easier to maintain strict control over the tension when running off a roll, as compared with the system of running over straining bars. Secondly, it is easier to straighten the filling when running off a shell, especially if a swinging let-off stand is employed. The tension at the let-off should be the minimum required to keep the automatic feeders active. Similarly, the tension at the take-up end of the tenter should be closely watched. This should be just enough to keep the roll turning; only sufficient to prevent the goods from dropping on the floor.

After the tentering, which has for its object the removal of drying creases in order to present the cloth in this form to an even distribution of the dressing or finishing liquor, the goods are passed through a two roll quetsch and passed once again through a loose dryer. If the goods can be rolled up from this drying operation, one motion can be eliminated. If they are folded in a box, it is again better to roll them up before further tentering for the reason previously stated. In this finishing tentering, the goods are stretched part of the width required to bring them to finished width, applying steam and seeing that the goods are thoroughly dry on rolling up. A second tentering to a little over the finished width is now made, to put the goods in condition for the last operation. If necessary, the goods are calendered cold, with as little tension as possible, and finally passed through a decatiser. Decatising practice varies greatly in different places, 30 secs. steam, 2 mins. vacuum, sometimes half these periods twice repeated. The goods are now ready for tubing.

PRINTING OTHER THAN VAT COLORS

Three other classes of colors also come into consideration for printing rayons. They are:

Solubilized Vat Colors
Stabilized Azoic Colors
Water Soluble Stabilized Diazotized Bases

Of these three classes of colors, the two former are most commonly used. The thickener usually employed is neutral starch-tragacanth. British gum should never be used with them, as it is said to give poor color value. Several of the converted gums give good results. Addition of a crystal gum has been found to give better running quality, but excessive amounts reduce the color yield. The maximum amount of this addition should not exceed 5 per cent. An addition of Soluble Pine Oil is also advantageous as it gives a heavier body, prevents the color from breaking and improves the flow. An extra heavy crystal gum has lately been introduced, which is of good assistance in maintaining the body of the color, when large quantity of liquid dyestuff must be used in a formula.

These two classes of colors are generally used separately, although both may be used in the same pattern. However, certain members of each class can be mixed with one another.

After printing, goods printed with these colors require acid ageing. A mixture of acids which has given good results, consists of:

4 parts Acetic Acid
1 part Formic Acid
5 parts Water

Some people use the concentrated acids, but this dilution provides quite sufficient acidity and the water in the mixture increases the humidity. Rinsing with water, light soaping and a second rinsing is enough. Removal of the thickener is all that is necessary.

Whilst the Water Soluble Stabilized Bases, more commonly known as "Salt colors," are used extensively in cotton printing, their use in rayon printing appears to be very limited, up to the present. One reason for this may be that it is necessary to carry out an extra operation, viz., preparing the goods with Naphthol. This is done by padding with 1¼ oz. Naphthol to the gallon, after which the goods are dried and afterwards printed with the bases, using as a thickener a converted gum or tragacanth or a mixture of the two. The color is formed immediately and is completely fixed on drying. When these colors are used alone, no steaming is necessary, When used with Solubilized Vat colors, they require a neutral ageing. These treatments are only necessary on account of the accompanying colors. Rinsing, light soaping and rinsing completes the process.

A Fundamental Study of Vat Printing Pastes

*A Project of the American Association of Textile Chemists and Colorists**

SIVERT N. GLARUM**

THIS project of the American Association of Textile Chemists and Colorists is entitled "A Fundamental Study of Vat Printing Pastes." This study was begun in 1933 and continued by the author until 1937. At this time Dr. L. F. Gleysteen took over the work and is continuing the study along lines similar to those which will be described.

In this study, we have tried to adhere strictly to the purpose expressed in the above title and make it deal solely with the fundamentals of vat printing.

The process of printing vat colors consists of three quite distinct operations; first, the preparation of the printing color; second, the application to the cloth; and third, ageing and oxidation of the dye. A preliminary survey made it apparent that it would not be possible to study the entire process at once as such a great number of variables were involved. It was decided, therefore, that the preparation of the printing colors should be the first subject to be studied. The other operations have been taken up as the work progressed.

"What are the necessary physical properties of a good printing color?" is the question asked of a number of printers. As a result, we were informed that the colors should be thick but not too thick, long but not too long, tacky but not too tacky, etc. The final answer of the printer in each case was to stir a tub of printing color with a stick and observe the manner in which the color flowed as the stick was raised. From this observation, the color was described as being good, fair, or poor according to the individual's experience.

It was apparent from this that the very first objective of this study must be to answer the question, "What are the necessary physical properties of a good printing color?"

All the replies to the above question involved the flowing properties in some manner or other so the measurement of these properties by a simple but accurate method became the first aim of the project. Although a number of unsuccessful attempts had been made previously to correlate the viscosities of printing colors with their printing qualities, it was decided that further experiments were worthwhile. The first conclusion was that printing colors must be treated as pseudoplastic materials so that ordinary viscometric measurements are of no value in studying their flowing characteristics. Materials of this class do not possess a true viscosity. Their apparent viscosity depends to a great extent on the conditions under which it is measured. The viscosity of a liquid such as castor oil is constant regardless of the stress applied. The apparent viscosity of a pseudoplastic substance may vary a hundredfold with comparatively slight changes in stress.

For measuring the flowing properties of printing pastes a method which was suggested by some work done on paints has been developed. The apparent fluidity of a sample is measured at a series of stresses and the data is plotted to obtain the flow curve. This curve presents an accurate picture of the flowing characteristics of that sample. It shows not only the apparent fluidity at varying stresses but the rate of change of fluidity with stress which is of much greater importance for many applications.

Using this method it has been possible to show the characteristic flowing properties and interpret the behavior of a wide variety of materials which could not have been done otherwise.

With the development of this method the problem of determining the necessary properties of a good printing color was attacked. Several hundred samples of printing colors and the prints produced with them were collected from a number of print works. In order to limit the number of variables as much as possible, colors were selected which were being used on small designs such as fine lines. The prints were graded as good, fair or poor on the basis of the accuracy of reproduction of the pattern engraved on the printing roller. The flow curves of the colors were measured as previously described. It was found that the flow curve of every color that produced a good print fell within very definite limits of fluidity. The further the curves were beyond these limits, the poorer were the prints produced. It was felt then that we had the answer to our initial question. While the limits

*Presented before Piedmont Section, Feb. 19, 1938.
**Rohm & Haas Co., Inc.

established were for a definite type of printing, the method is adaptable to the establishment of such limits for any class of work.

It is no longer necessary to describe the properties of printing colors as long or short, thick or thin. The determination of the flow curve gives an accurate and reproducible measurement of its flowing properties that can be understood by anyone, experienced or not.

THICKENERS

The next phase of this investigation was to determine how to produce colors possessing these flowing properties.

Besides the dyestuff, a printing color contains one or more thickening materials, a reducing agent, some alkali and a variety of other materials which are added to alter the working properties of the color. Since this was to be a fundamental study, only the essential ingredients have been considered in detail. The effects of the various assistants will be studied later.

The thickeners in a printing color are almost solely responsible for the flowing characteristics of the color. The other constituents are concerned in this respect only as they may affect the properties of the thickeners. The "color yield" is also greatly influenced by the thickener used in the color.

The principal types of thickeners are the starches, British Gums and the natural gums. The flow curves of pastes made with these materials have shown that each possesses certain characteristics peculiar to itself. In mixtures the properties are additive to a certain extent so that it is possible to produce pastes of almost any desired flowing characteristics.

Since this was a fundamental study, a rather fundamental and long used thickening was chosen to be studied first. This is a mixture of equal parts of corn starch and a high soluble British Gum.

Any study of thickeners is largely a study of the methods of preparing the pastes and the present study is no exception. The effects of the temperature, length of time and the concentration of cooking have been studied as well as the effect of adding the alkali at different stages. To sum up the results very briefly, it was found that the more thoroughly the starch-British Gum mixture is cooked the greater is the thickening value and the greater the "color yield." The addition of the alkali after cooking also produces a paste with greater thickening value than if the alkali is cooked in the paste.

This study is far from complete and only a few of the vast number of thickeners have been investigated.

AGEING

The mention of the subject of ageing seldom fails to evoke at least a smile from the listener. Much has been written and said on this subject but there is little factual information available. After making the usual measurements of temperatures and analyzing vapors in plant agers it was obvious that a fundamental study of this operation was also necessary. This study has just been started and no results are available. Professor E. K. Strachan at Brown University has taken an active interest in this investigation and with his cooperation an apparatus has been constructed so that accurate measurements may be made on printed or unprinted goods under conditions duplicating those occurring in plant agers. Much valuable information should result from this study.

It is possible to make some interesting calculations from data already at hand. If we compute the various heats of solutions and wetting which may occur when printed goods are passed into a steam ager, it at once becomes apparent that the chief source of heat is the heat of wetting of the cotton which in this case also includes the heat of condensation of steam. This in itself is sufficient to account for many times the temperature rise which is so often observed. It may be possible to eliminate this effect if we take advantage of a rather unusual equilibrium condition between the cotton and water vapor in the air. Data is available showing the amount of moisture taken up by cotton from the air at various humidities and at temperatures up to slightly above 212° F. These data show that at a given per cent humidity the amount of moisture taken up by cotton is constant regardless of the temperature. That is, if we have cotton in equilibrium with air of x% humidity at 75° F. it will contain the same amount of water as cotton in equilibrium with air of x% humidity at 212° F.

If we were to bring a piece of cotton to equilibrium with air saturated with water at room temperature we would find that no further water would be taken up when this material was placed in saturated air at 212° F. This offers interesting possibilities in methods of diminishing or eliminating the heat effect during ageing.

It is realized that the results obtained so far by this project go only a little way toward solving the many problems concerning printing. New products and problems arise daily and these alone could occupy the full time of such a study. The purpose of a fundamental study such as this is to lay a ground work which will make it possible to make a more efficient and intelligent use of the materials which are available.

DISCUSSION

Chairman: When the Research Committee of our Association went into this problem of printing thickeners, I, personally, thought it was with a great deal of courage that they undertook a problem as difficult of investigation as this, for I believe the question of printing thickeners is filled with more prejudices and less science than any other phase of the textile finishing industry. I think the Association's courage was justified in the ground work that Dr. Glarum has laid for this project, and from this ground work there should be a great deal of real scientific data gathered and accumulated on printing thickeners. I am sure there are quite a few questions that this discussion has brought to your minds, and I know Dr. Glarum will do his best to elaborate on his work and answer any questions you may raise.

I have one or two questions myself. I note on these charts that you drew on the time of cooking which show the effect of viscosity of different temperatures, that the higher the temperature the greater the viscosity. What was the time of cooking?

Dr. Glarum: These samples were all cooked for one hour in the apparatus which we built. This machine was equipped with stirrers which actually scraped the walls of the beakers throughout the cooking. This maintained a uniform temperature throughout the paste. We checked this in many ways until we were sure that consistent results could be obtained.

Chairman: All the data that you have presented on the time of cooking and viscosities was on the starchy materials, British gums, with only alkali and hydrosulfite?

Dr. Glarum: Yes. The alkali was added at a definite temperature, 170° or 175° F., as soon as the starch was thoroughly thickened. We felt that adding it at a fixed temperature, rather than at a fixed time, would give a better result.

Chairman: I do not know how familiar you are with straight starch cooking, but is it not true for straight starch cooking that a certain maximum is reached and after that time the viscosity will decrease?

Dr. Glarum: Yes, that is true with straight starch.

Chairman: But in these pastes cooked with alkali you did not find that property?

Dr. Glarum: The pastes that we prepared were often cooked as long as four hours. Some were carried up to six hours, but the changes after four hours were of small magnitude. Cooking for this time caused no decrease in viscosity with the formula we were using.

Chairman: Is it true that with straight starch you would pass your maximum thickness in four to six hours?

Dr. Glarum: I think this is very true from the results of other work that has been done on starch pastes. We did not go into that. The fact that soda ash is present in the pastes might change the picture somewhat. I would appreciate any kind of criticism of this work to aid the committee in planning a program. There has been some comment that there has not been enough cooperation with this district on this subject, and I assure you that any criticism or suggestions will be passed on and used.

Mr. Hayes: On your first diagram, were those measurements taken the same day the particular starch was cooked? Was there any difference between the measurements taken on the same day they were made and after standing? In my experience pastes are cooked and used in a day or two or three, and sometimes longer. In case of bad business, they may stand ten days.

Dr. Glarum: In all cases we let these pastes stand over night. The preparation took several hours so they could not reach equilibrium at room temperature unless they stood over night. After that, there seemed to be very little change. The relative results were the same. There was some thickening, a slight shift of position, of the curves, but not enough to be of any significance.

Mr. Jackson: I did not understand at what temperatures those first pastes were cooked? What did you give the first time?

Mr. Glarum: They were cooked at 205° and 210°.

Mr. Souther: You said that soda ash should be added later. I did not get that.

Dr. Glarum: We found that the thickest paste and the best color value was given when soda ash was added after the pastes had cooled. In practice this cannot be done readily due to the difficulty in obtaining complete solution and the best time would be to add it at the end of the cooking. A different ratio of starch to gum might give somewhat different results, and that work has not been finished as yet. These results are taken on the basis of a one to one ratio: one part cornstarch to one part high soluble British gum.

Chairman: To any of these pastes, have you added any fat or oil?

Dr. Glarum: We felt there were so many of these "assistants" it was impossible to study them at the present stage of development. There were so many things we wanted to find out about starch and gum thickeners, that we did not get into these materials at all. They are very definitely on the program of this study.

Chairman: I think that enters very materially into the matter of the thickeners.

Dr. Glarum: Yes. I think that is very true.

Chairman: Have you investigated at all the effect and relative merits on the different thickeners, of oils and fatty materials in respect to their effect with printing pastes, because generally they lower the viscosity somewhat?

Dr. Glarum: We have not experimented with these materials enough to reach any conclusions.

MEETING, PHILADELPHIA TEXTILE SCHOOL STUDENT SECTION

ON Tuesday, April 26, 1938, a regular meeting of the Philadelphia Textile School Student Section was held, with Chairman Wayne Fry presiding.

Dr. Charles Mullin presented a very interesting topic to the Section, namely "Dri Sol Process for Unshrinkable Woolens." The subject for the final meeting of this school year will be "pH."

Respectfully submitted,

ROBERT ROECKER, *Secretary*.

ONE HUNDRED AND SEVENTEENTH COUNCIL MEETING

THE Council held its 117th meeting at the National Bureau of Standards in Washington, on Saturday morning, April 30, 1938. Present were President Alban Eavenson presiding; Duncan Ferguson and Arthur R. Thompson, Jr., Vice-Presidents; William R. Moorhouse, Treasurer; Louis A. Olney, Chairman of the Research Committee; William H. Cady and P. J. Wood, Past Presidents; Harold DeWitt Smith, Councilor at Large; R. M. Ritter representing Philadelphia and Thomas R. Smith representing Piedmont; and Harold C. Chapin, Secretary. Also present were William D. Appel, W. E. Emley, A. Henry Gaede, and Donald H. Powers. The Secretary's report of the 116th Council meeting, the Treasurer's report of April 30, and the Secretary's balance sheet attached hereto, were accepted.

Dr. Carl Z. Draves was appointed to arrange the technical program for the Annual Meeting; and it was voted that the Council meeting be on Friday morning, to permit starting the general program that afternoon. President Eavenson and Dr. Harold DeWitt Smith outlined the new program of research to be instituted by the Textile Foundation.

Each of the following was elected to the class of membership specified, as of thirty days from publication of application, provided that no objection be received meanwhile by the Secretary:

Active

R. Armenante	P. N. Collier	J. V. Galloway
F. L. Asbury, Jr.	W. U. Collier	C. F. Gibson
H. L. Barthelmy	W. Cooper	N. A. Greenawalt
G. R. Beebe	C. H. Covington	H. P. Gross
G. Bertrand	T. F. Daley	E. N. Grotjahn
B. Borrmann	W. B. DePass	A. E. Hatfield
M. O. Brueckner	G. J. Desmond	W. P. Holt
G. D. Brymer	W. J. Digrius	W. C. Hunter
D. J. Burns	G. L. Dozier	K. Hurley
W. B. Carroll	A. G. Fisher, Jr.	G. D. Jackson, Jr.
W. C. Colb	W. C. Fritz	C. R. Johnson
Allen Jones	R. H. McKinney	H. E. Shearer
F. L. Kibler	J. S. Mitchell	W. S. Sims
C. L. Krause	M. S. Moore	B. F. Smith
E. F. Landis	A. L. Moses	G. F. Spencer
E. P. Lavoie	R. H. Park	R. S. Steele, Jr.
J. A. Leavering	J. D. Quern	A. R. Tucker
E. N. Livingston	F. P. Reilly	S. J. Walker
J. C. Martin	J. W. Robertson	H. A. Webb
C. W. Mason	T. Rollinson	C. F. Weiss
E. W. McClure	T. Rostron	H. White
D. R. McIver	Alexander Roy	C. B. Wood
	A. G. Scattergood	

Junior

E. Jones	H. P. Loveless, Jr.	J. W. Ross
H. H. Latham	R. H. Mabry, Jr.	W. H. Sites

Associate

H. I. Belton	T. W. Kethley	F. F. Ogden
L. R. Brumby	P. V. Keyser, Jr.	F. E. Schroeder
L. R. Caplan	J. F. Kirk	W. S. Sewell
O. T. D'Allessio	A. L. Kling	C. R. Smith
G. M. DeCamp	M. A. Land	J. M. Sobin
L. A. Dillon	P. J. Luck	J. N. Street
B. Egeberg	J. J. Morris	J. C. Turner

Student

H. M. Curry	C. C. Hill	C. W. McGowin
N. D. Helms	J. J. Jigger	J. H. Parechanian

Respectfully submitted,

HAROLD C. CHAPIN, *Secretary.*

ONE HUNDRED AND TENTH MEETING OF THE RESEARCH COMMITTEE

THE 110th meeting of the Research Committee followed the Council meeting in Washington on Saturday afternoon, April 30, 1938. Present were Chairman Louis A. Olney presiding, W. C. Alfred, W. D. Appel, K. H. Barnard, J. R. Bonnar, W. H. Cady, Alban Eavenson, W. E. Emley, Duncan Ferguson, A. H. Gaede, Milton Harris, C. C. Hubbard, W. R. Moorhouse, G. A. Moran, D. H. Powers, R. M. Ritter, H. DeW. Smith, T. R. Smith, A.

SECRETARY'S BALANCE SHEET—APRIL 23, 1938

	Applications	*Dues, Regular and Reinstate.*	*Dues, Corporate and Sustaining*	*Miscellaneous*	*Bank Charges*	*Totals*
Received by Secretary, Nov. 1, 1937 to Feb. 5, 1938	$742.50	$7,982.75	$2,110.00	$1,199.26	—1.80	$12,032.71
Received by Secretary, Feb. 5 to Apr. 23, 1938	455.00	788.96	45.00	200.47*	—2.85	1,486.58
Total Received	1,197.50	8,771.71	2,155.00	1,399.73	—4.65	13,519.29
Transmitted to Treasurer	1,142.50	8,720.46	2,155.00	1,351.73		13,369.69
Leaving to order of Secretary	55.00	51.25	.....	48.00	—4.65	149.60

*** Miscellaneous items**

Year Books	$130.50	Analytical Methods	.75
Knitted tubing	29.52	Dyed standards	13.00
Crock-Meter cloth	6.00	Dyestuff Reporters	1.50
Buttons	18.00	Printing Paste Reports	1.20
		Total	$200.47

J. Sokol, A. R. Thompson Jr., S. J. Walker, P. J. Wood, and H. C. Chapin. Mr. Hubbard and Mr. Alfred were invited to present their views on the laundering and dry cleaning of crease proofed fabrics. In reply Mr. Barnard, Dr. Powers, and Mr. Sokol presented the views of manufacturer and dealer.

Part of the new light fastness standards being prepared under direction of Mr. Christison were shown. These were stock dyed instead of piece dyed, for the sake of better results; which explained delay in completion of the series. With regard to criticism of our light fastness tests in a recent paper by E. M. Edgerton, it was suggested that wetting of goods under test might render results more indicative of fastness to home laundering. This was referred to the Light Fastness Committee. A letter was presented from Dr. Paul Krais, inviting the Association to send representatives to a conference of British and Germans at Dresden on May 23 and 24, to discuss light fastness standards.

The patent on the Crock-Meter, assigned to the Association by W. C. Durfee, was presented. Mr. Moran showed samples of wool stained by rubber balls in the Launderometer, and reporting detection of lead in the stains, recommended use of balls free from lead. Mr. Cady presented a preliminary report of the literature on effect of light upon strength of cotton, in presence of dyes, etc. A letter from Alexander Morrison suggested to the Committee the problem of distinguishing new from reworked wool; but the consensus of opinion was that except in certain special cases the difference is to be found only in the known history of the material.

Respectfully submitted,

H. C. CHAPIN, *Secretary.*

MEMBERSHIP APPLICATIONS

Active

Everett M. Brown—Dyer, Tilton Hosiery Mill, Laconia, N. H. Sponsors: W. F. Haskell, E. M. Glennon.

Cyril J. Byron—Overseer of Dyeing, Barre Wool Combing Co., South Barre, Mass. Sponsors: H. J. Sheehan, J. N. Dalton.

Julius V. Collier—Dyer, Lawler Hosiery Mills, Carrollton, Ga. Sponsors: E. M. G. Schroder, J. F. Oliver.

Frederic Dannerth—Research Chemist, Maas & Waldstein Co., Newark, N. J.

Robert O. Dietz—Director of Textile Laboratory, Marshall Field & Co., Spray, N. C. Sponsors: R. H. Souther, J. W. Ivey.

Oliver G. Edwards—Chemist, Avondale Mills, Sylacauga, Ala. Sponsor: A. R. Macormac.

A. Wilkerson Gunn—Finishing Dept., Callaway Mills, La Grange, Ga. Sponsors: A. R. Macormac, H. S. Weisz.

Carl G. Hard—Overseer of Dyeing, Ames Worsted Co., Southbridge, Mass. Sponsors: H. J. Sheehan, J. N. Dalton.

Milton J. Hoffman—Chemist and Dyer, Alden Hosiery Mills, New Orleans, La. Sponsors: D. S. Culberson, E. F. Smith.

William Alexander Howard—Demonstrator, Du Pont Co., Columbus, Ga. Sponsors: W. F. Crayton, J. H. O'Neill.

Frank R. Iler—Asst. Technical Supt., Callaway Mills, La Grange, Ga. Sponsors: A. R. Macormac, H. S. Weisz.

M. Louis Kirby—Salesman, John Campbell & Co., West Point, Ga. Sponsors: A. R. Macormac, M. T. Johnson.

Walter G. Leon—Salesman and Demonstrator, Haas-Miller Corp., Philadelphia, Pa. Sponsors: H. P. Goller, W. A. Wolhar, R. H. Souther.

Alvin H. Leonard—Overseer of Dyeing and Weaving, Callaway Mills, La Grange, Ga. Sponsors: J. M. Youngblood, A. R. Macormac.

Z. B. Mangum—Supt. Sally-B Mills Division, Avondale Mills, Sylacauga, Ala. Sponsors: H. P. Faust, E. J. LeFort.

Carleton E. Morrill—Chemist, Lewiston Bleachery & Dye Works, Lewiston, Maine. Sponsors: W. F. Haskell, E. M. Glennon.

Hugh H. Mosher—Director of Textile Chemical Research, Onyx Oil & Chemical Co., Jersey City, N. J. Sponsors: C. D. Ehrengart, W. A. Dainton.

Joseph H. O'Donnell—Treasurer, Woonsocket Color & Chemical Co., Woonsocket, R. I. Sponsors: J. H. Kilcommons, T. E. Goulet.

Linwood E. Page—Chemist and Overseer, Aspinook Corp., Jewett City, Conn. Sponsors: I. W. Fallstrom, D. A. Bunce.

Sam J. Patrek—Foreman of Bleaching and Dyeing, Minneapolis Knitting Works, Minneapolis, Minn. Sponsors: P. F. Willgeroth, C. E. Maher.

William Perl—Dyer, Edward M. Kahn Corp., Glendale, L. I., N. Y. Sponsors: A. F. Johann, Charles Muller.

Charles M. Robbins—Dyer, Phoenix Hosiery Co., Milwaukee, Wis. Sponsors: A. G. Alexander, Joseph Wauters.

Irving Rubinstein—Colorist, Warren Textile Print Works, West Warren, Mass. Sponsors: C. D. Ehrengart, W. A. Dainton.

Walter B. Sellars—Supervisor of Quality Control Dept., Burlington Mills, Greensboro, N. C. Sponsors: R. H. Souther, H. A. Barnes.

William M. Slaughter—Asst. Dyer, Callaway Mills, La Grange, Ga. Sponsors: J. M. Youngblood, A. K. Haynes.

Henry Roger Varvaro—John Campbell & Co., New York, N. Y. Sponsors: Raymond Alvater, Nicholas Brescia.

W. A. Wardell—Salesman and Demonstrator, Rohm & Haas Co., Charlotte, N. C. Sponsors: P. H. Delplaine, A. R. Thompson Jr.

Raymond F. Wein—Dyer, Bancroft Lace Co., West Warwick, R. I. Sponsors: J. A. Kilcommons, Arthur Veevers.

Frederick C. Wittig—Branch Manager, Ciba Co., Boston, Mass. Sponsors: H. A. Morrison, J. N. Dalton.

Junior

Elmer Collier—Asst. Dyer, House of Byer, Inc., Cambridge, Mass. Sponsors: Ira Sapers, H. C. Chapin.

J. Melvin Fields—Asst. Chemist, Proximity Print Works, Greensboro, N. C. Sponsors: R. H. Souther, H. A. Barnes.

William J. Fitzgibbon—Chemist and Finisher, Liondale Bleach, Dye and Print Works, Rockaway, N. J. Sponsors: J. R. Duncan, James Hargreaves.

James W. Harper—Textile Laboratory, Union Bleachery, Greenville, S. C. Sponsors: C. N. Rabold, R. W. Arrington.

Walter S. Osborne—Student, University of South Carolina, Columbia, S. C. Sponsors: J. W. Ivey, P. H. DelPlaine.

Kelly E. Traynham—Chemist, Ware Shoals Mfg. Co., Ware Shoals, S. C. Sponsors: H. E. Kiefer Jr., A. R. Thompson, Jr.

Walter Lee Whisnant—Salesman and Demonstrator, Stodghill & Co., Atlanta, Ga. Sponsors: H. G. Miller, L. W. Sherrill.

Associate

Thomas R. Baravalle—Demonstrator, Aqua Sec Corp., New York, N. Y. Sponsors: Boris Uzunoff, L. S. Hirsch.

Hugh J. Bonino—Salesman, The George E. Sherman Co., Hoxsie, R. I. Sponsors: J. A. Kilcommons, Arthur Veevers.

Exley Floyd Cail—Salesman, Myles Salt Co., New Orleans, La. Sponsor: H. G. Miller.

Hugh W. Causey—Salesman, Solvay Sales Corp., Charlotte, N. C. Sponsors: J. W. Ivey, H. O. Pierce.

Paul Davis—Salesman, Manufacturers Soap & Chem. Co., Cleveland, Tenn. Sponsors: Nestor Grotelueschen, W. S. McNab.

Harold Heiot—Vice President, Aqua Sec Corp., New York, N. Y. Sponsors: Boris Uzunoff, L. S. Hirsch.

Jesse MacRae Howard—Sales Manager, Augusta Chemical Co., Augusta, Ga. Sponsors: R. L. Rhoden Jr., H. W. Field.

George S. Kyle—Asst. Secretary and Purchasing Agent, Muscogee Mfg. Co., Columbus, Ga.

Frank J. Murphy—Salesman, Sandoz Chemical Works, Boston, Mass. Sponsors: R. E. Derby, H. A. Ross.

William Henry Scott—Vice President, Aqua Sec Corp., New York, N. Y. Sponsors: Boris Uzunoff, L. S. Hirsch.

SPRING MEETING, PIEDMONT SECTION

THE Spring Meeting of the Piedmont Section was held at the King Cotton Hotel in Greensboro, N. C., on Saturday, May 7th, 1938. Golf was played in the morning at the Starmount Club. The well attended afternoon session was opened by Dr. Raphael E. Rupp, Chairman. Henry B. Dixon of the May Hosiery Mills spoke on the "Dyeing of Iridescent Colors on Hosiery"; and Ross M. Stribling, of the American Enka Corporation, on the "Dyeing of Rayon Hosiery". Dr. Beaty, Professor of Sanitary Engineering in the School of Public Health, Chapel Hill, University of North Carolina, spoke on "Mill Waste", describing objections to it and methods of treatment. He introduced H. J. Miles and Ralph Porges, who presented a paper on the pilot plant in Greensboro, illustrated by lantern slides.

At the banquet in the evening over two hundred were present. After a program of general entertainment Mr. Luther Hodges, General Manager of the Manufacturing Division of Marshall Field & Co., in Spray, N. C., spoke on the general situation in the country and in the textile industry.

Respectfully submitted,

J. W. IVEY, *Secretary.*

MEETING, LOWELL TEXTILE INSTITUTE STUDENT SECTION

A MEETING of the Lowell Textile Institute Student Section was held on Thursday, February 10, with Chairman Herman T. Buckley presiding.

Mr. Ben Verity of the Carbic Color and Chemical Company gave a talk on the use of Indigosols and Rapidogens in dyeing and printing.

Respectfully submitted,

ROBERT A. LEMIEUX, *Secretary.*

OUTINGS, LOCAL SECTIONS

MOST of the local Sections have made arrangements for summer outings and golf tournaments. Three are scheduled for June 10th. The New York Section will hold its outing on that date at the North Jersey Country Club, Paterson, N. J. Albert J. Royce is chairman of the Outing Committee. Dinner reservations should be made with John J. Sokolinski, Arabol Mfg. Co., 110 East 42nd Street, New York City. The Philadelphia Section has also scheduled its outing for the same date and will hold it at the Whitemarsh Valley Country Club, Whitemarsh, Pa. Dinner tickets are available from Harold B. Dohner, 3047 Amber Street, Philadelphia, Pa. The Rhode Island Section will hold its outing also on June 10th at the Pawtucket Golf Club, Pawtucket, R. I. Wilfred Lord is chairman of the Outing Committee and James Kilcommons is chairman of the Dinner Committee. The outing of the Northern New England Section will be held on Friday, June 17th, at the Andover Country Club, Andover, Massachusetts. Henry Sheehan is chairman of the Outing Committee. The outing of the Piedmont Section is scheduled to be held at the Ocean Forest Hotel, Myrtle Beach, S. C., on June 24th and June 25th. The outing of the South Central Section will be held on August 5th and 6th at the Lookout Mountain Hotel. The Outing Committee is under the chairmanship of Robert Covington. It is announced that special entertainment will be provided for lady guests.

BOOK REVIEWS

Management of a Textile Business
Balderston and Karabasz
Textile Costing—An Aid to Management
Lockwood and Maxwell
Marketing of Textiles
Cox
The Textile Industries—An Economic Analysis
Michl

The Textile Foundation takes pleasure in announcing the publication of the above books on the textile industries of the United States.

These books were written primarily to provide business background for students in the textile schools and colleges and to supplement their technical training with materials that will help them to a better understanding of business methods and of the business problems that will confront them when they enter the textile industries. The scope of the books is so wide and the treatment is of such a nature that we believe members of the trade will find them useful, informative and interesting. They should prove especially valuable to employees engaged in minor executive and supervisory work who would like to obtain a clearer understanding of the economic forces and trends that affect the textile industries and a better perspective of the organization, management practices and marketing methods of the several branches of the textile and allied industries. They should also serve to provide excellent teaching materials for training courses for foremen and minor executives.

Management of a Textile Business focuses attention upon management policies and techniques that must be considered in the running of a mill. It is concerned with the layout of the mill and its equipment; the control of labor and labor costs; the procurement and storage of materials and supplies; controlling the flow of orders through the mill; price setting; and the control of the business as a whole through organization, supervision and budgeting. The illustrative material is drawn from actual situations and is intended to clarify the discussion and bring out significant comparisons between the various textile industries.

Textile Costing—An Aid to Management stresses the importance of cost data and their use to management in the running of a mill. It is not intended for textile accountants but rather to indicate to executives the principles of costing and the ways in which a knowledge of costs can help management in making its control of mill operations more effective. The burdensome detail of journal entries, cost forms and accounting department records, characteristic of most texts on accounting, has been reduced to a minimum and has not been permitted to overshadow the basic principles of material, labor and overhead costs and their implications to management.

The Marketing of Textiles describes the methods used by the textile industries to move its products into consumption. Beginning with a discussion of the marketing of raw cotton, wool, silk and rayon, it traces the methods and agencies employed in marketing yarn and cloth from process to process into the hands of industrial and institutional buyers, cutters and ultimate consumers. It also discusses the influence of styles and fashions and the methods employed to cope with them; the price policies and problems of the industry and their influence on marketing; and concludes with a discussion of devices for sales promotion, the problem and control of unfair competition, and proposed ways of reducing the costs of marketing.

The Textile Industries—An Economic Analysis focuses attention not on the individual mill but on the industry as a whole. It shows how the policies of the individual mill are influenced by those of its competitors and how the industry as a whole is affected by economic forces such as fluctuating raw material prices, excess capacity, rise of new producing areas, international competition, changes in rates of growth, etc. Each branch of the industry is given separate treatment and its particular economic problems are analyzed. The book ends with a discussion of proposed methods of stabilizing the textile industries through individual action and by trade association activities and governmental regulation.

The books were prepared by members of the staff of the Wharton School of Finance and Commerce of the University of Pennsylvania and, as the above description indicates, present a connected and integrated analysis of the textile industries from the mills to the consuming markets.

The costs of preparation were underwritten by the Textile Foundation and are being offered to the trade at a price that covers only the publication costs. The books can be ordered through the Textile Foundation, Commerce Building, Washington, D. C., and may be purchased singly or by complete sets, at the rate of $2.00 per single volume and $6.00 for the set.

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Photoelements and Their Application. *Lange, Bruno. New York: Reinhold Publishing Corporation,* 1938. *297 pp.*

The material is presented in two parts. In Part I, the history, theory, and physical properties of semiconductor photo-cells are presented in simple, semi-technical, and stimulating language. Part II covers the technical uses of photoelements. In rather orthodox catalog manner are illustrated, pictured, and described the construction and performance of photoelements, and instruments and apparatus typical of photo-cell application in the commercial, experimental, and research fields of today.

Beginning with the Galvanic Elements, and the discoveries of Oersted, Faraday, and Ohm, the comparative history of galvanic and photoelements is traced from 1832 to the present time. With suitable diagrams, the external and internal photoeffects and non-technically presented. The development of the electrolytic elements begins with Becquerel's discovery in 1839, and continues with the growth of layer, selenium, and crystal cells. Excellent

diagrams and photographs supplement this descriptive history.

The theories of semiconductor photoeffect include lattice distortion points, Barrier Layer Theory, Field Tunnel Theory, crystal photoeffect, the Einstein Relation, and others. Considerable technical analyses, equations, and curves support the various theories.

The physical properties of photoelements are rather comprehensively graphed. The influence of polarized light, sensitivity to X-ray radiation, and influence of cathode rays are discussed and charted. Threshold wavelengths, influence of magnetic fields, capacity and frequency relations, fatigue and stability—all round out a thorough analysis of photo-cell properties.

The technical uses of photo-cells begin with a brief picture of construction details. Included are typical performance curves and equations. Then follow in large quantities, applications of photo-cells. The applications are depicted by photographs, sketches, and descriptions of typical illumination meters, photographic exposure meters, photometric apparatus, amplifying and signal equipment.

Indicative of the range of cell applications covered in this treatise are the following random selections—ultraviolet photometer, diffusivity meter, Ulbricht's sphere, exposure meters for all branches of photography, density meters, synchronous writer, spectrophotometer, colorimeter, flow colorimeter, visibility meter, photoelectric balance, relays, train controls.

A summary of cell use in various fields concludes the book.

A bibliography of over 100 items follows each part.

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Progres realises dans l'application des Matieres Colorantes (Progress Achieved in the Application of Dyestuffs); *by L. Diserens, Chem. Eng., Sc.D. Teintex, 60 rue de Richelieu, Paris, France. VI + 280 pp. Price fr. 100.*

The work here cited is the first of two volumes, which are an amplification and extension of a paper published in the Revue Generale des Matieres Colorantes, in 1936. This present volume covers the following groups:

I—Vat Dyestuffs.
II—Mordant Dyestuffs.
III—Basic Dyestuffs.
IV—Substantive Dyestuffs.
V—Aniline Black.

Each of these topics reviews exhaustively the various assistants and methods which have been used, which are being used, and which have been proposed for use, in the application of dyestuffs coming under the group under discussion; copious reference being made both as to papers published in the journals, and to patents (including American patents). Besides definite recipes in some cases, much information is given besides as to the assistant under consideration, and this, from a careful scientific viewpoint. Whenever the structural formula of a substance considered is known, it is given clearly; the citation of a product is much more than the quotation of its trade name, its asserted properties, etc. We would refer, by way of example, to pp. 208-221, under the heading of "Improvement of the Fastness of Substantive Dyeings Toward Water and Soap," and to the tables on pp. 224-235.

The work is clearly and interestingly written, and excellently printed. The reviewer has read it with interest and pleasure, and to some of its pages owes a better understanding of what before was only surmise, as to some of the assistants which have passed only under their trade names. The author has produced a work which will be helpful to thoughtful textile chemists, in giving many of them an understanding of processes which they, perhaps, are using, but mechanically and as a matter of prescription.

We expect the second volume to be as good and useful as this present one, and shall be glad indeed of the opportunity to examine it.

FREDERICK S. BEATTIE.

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